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United States
Department of
Agriculture

Forest Service

Cody, Wyoming

FINAL ENVIRONMENTAL IMPACT STATEMENT

SHOSHONE NATIONAL FOREST

Volume I

Chapters I-V and VII-IX and Appendices

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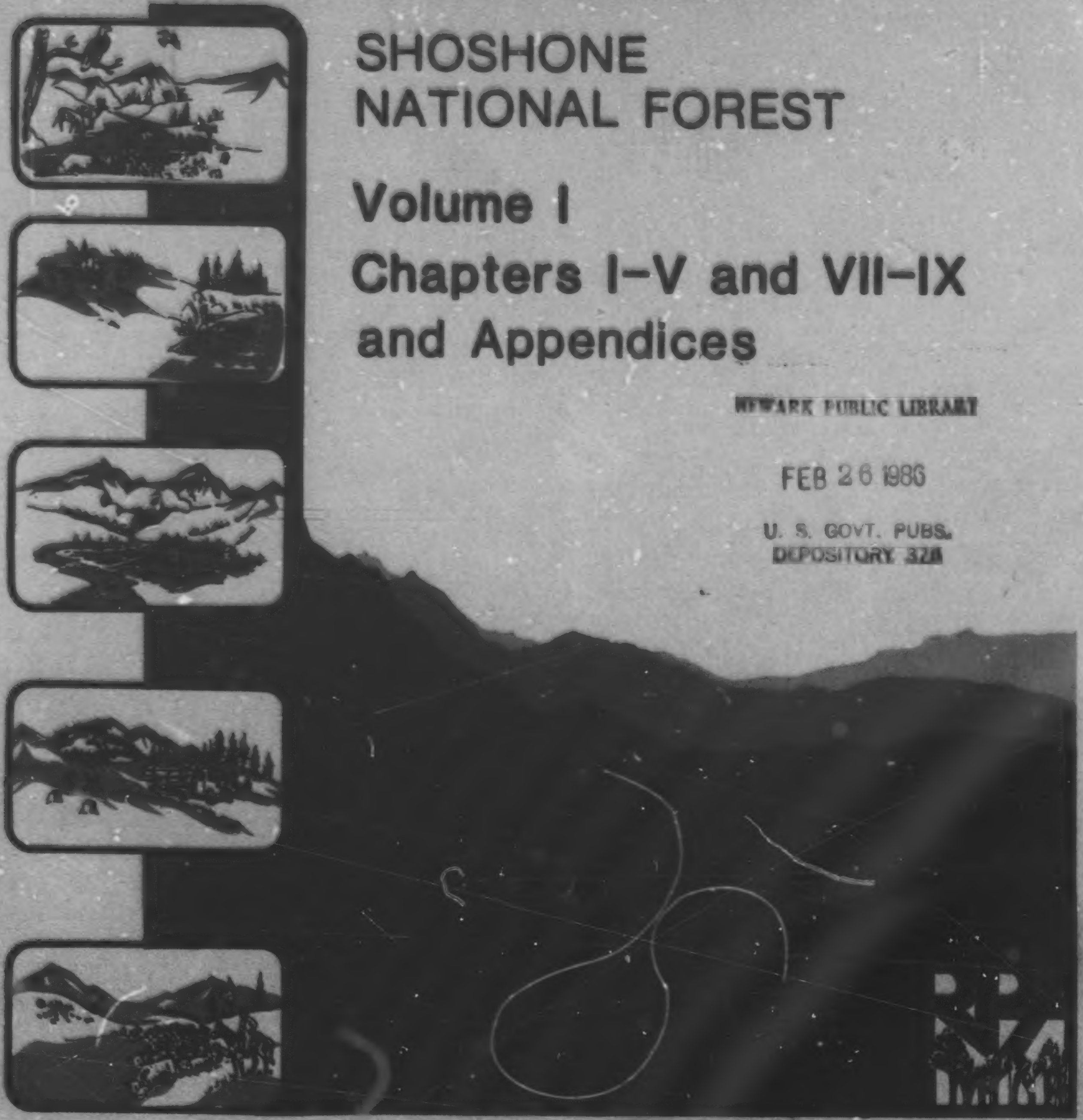

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FINAL ENVIRONMENTAL IMPACT STATEMENT
for the
SHOSHONE NATIONAL FOREST
LAND AND RESOURCE MANAGEMENT PLAN

02-14-85-01

Park, Fremont, Sublette, Teton and Hot Springs Counties, Wyoming

TYPE OF ACTION: Administrative

LEAD AGENCY: USDA-Forest Service

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ABSTRACT: Six alternatives for development of a Land and Resource Management Plan for the 2,433,125-acre Shoshone National Forest are described and evaluated. The alternatives and their emphases are as follows.

- Alternative A. Emphasis is on following current management direction and on producing current levels of commodity outputs (no action).
- Alternative B. Emphasis is on production of commodity resources with increased timber production, domestic livestock production at current levels, and relatively unrestricted mineral activity.
- Alternative C. Emphasis is on production of noncommodity resources with decreased domestic livestock production, decreased timber production, and more restrictions on mineral activity.
- Alternative D. Emphasis is on production of noncommodity resources, with production of domestic livestock and timber at current levels, and more restrictions on mineral activity.
- Alternative E. Emphasis is on production of essential outputs with a 25 percent reduction from the 1982 budget.
- Alternative F. Emphasis is on meeting Resource Planning Act targets as assigned in the Regional Guide.

Alternative D is the Forest Service preferred alternative and is the alternative selected for the Forest Plan. The Forest Plan will guide management of Shoshone National Forest for the next ten to fifteen years. It will be revised by the year 2000.

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Shoshone National Forest
Land and Resource Management Plan
Final Environmental Impact Statement

Volume I

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SUMMARY

SUMMARY OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT

INTRODUCTION

This Environmental Impact Statement (EIS) discloses a course of action, as well as alternatives to that action, for managing the Shoshone National Forest through the next ten to fifteen years. It also describes the environment that will be affected and the potential environmental consequences of implementing the proposed action and each alternative.

This document and its supporting analysis provide specific disclosure of estimated environmental, economic and social effects of alternative management stratagies for a period of ten to fifteen years. Estimates beyond this period are displayed for decisionmaker and public information only.

Figure 1 displays the location of the Shoshone National Forest. A total of 2,433,125 acres of National Forest System lands are included in this administrative unit of the Rocky Mountain Region of the Forest Service, U.S. Department of Agriculture. The Forest includes large portions of Fremont and Park Counties, and smaller portions of Sublette, Teton and Hot Springs Counties in Wyoming. It lies along and to the east of the continental divide, bordering Yellowstone National Park and the Bridger-Teton National Forest.

PURPOSE AND NEED

Preparation of the Forest Plan is required by the Forest and Rangeland Renewable Resources Planning Act (RPA), as amended by the National Forest Management Act (NFMA). Assessment of its environmental impacts is required by the National Environmental Policy Act (NEPA) and the implementing regulations of NFMA (36 Code of Federal Regulations 219).

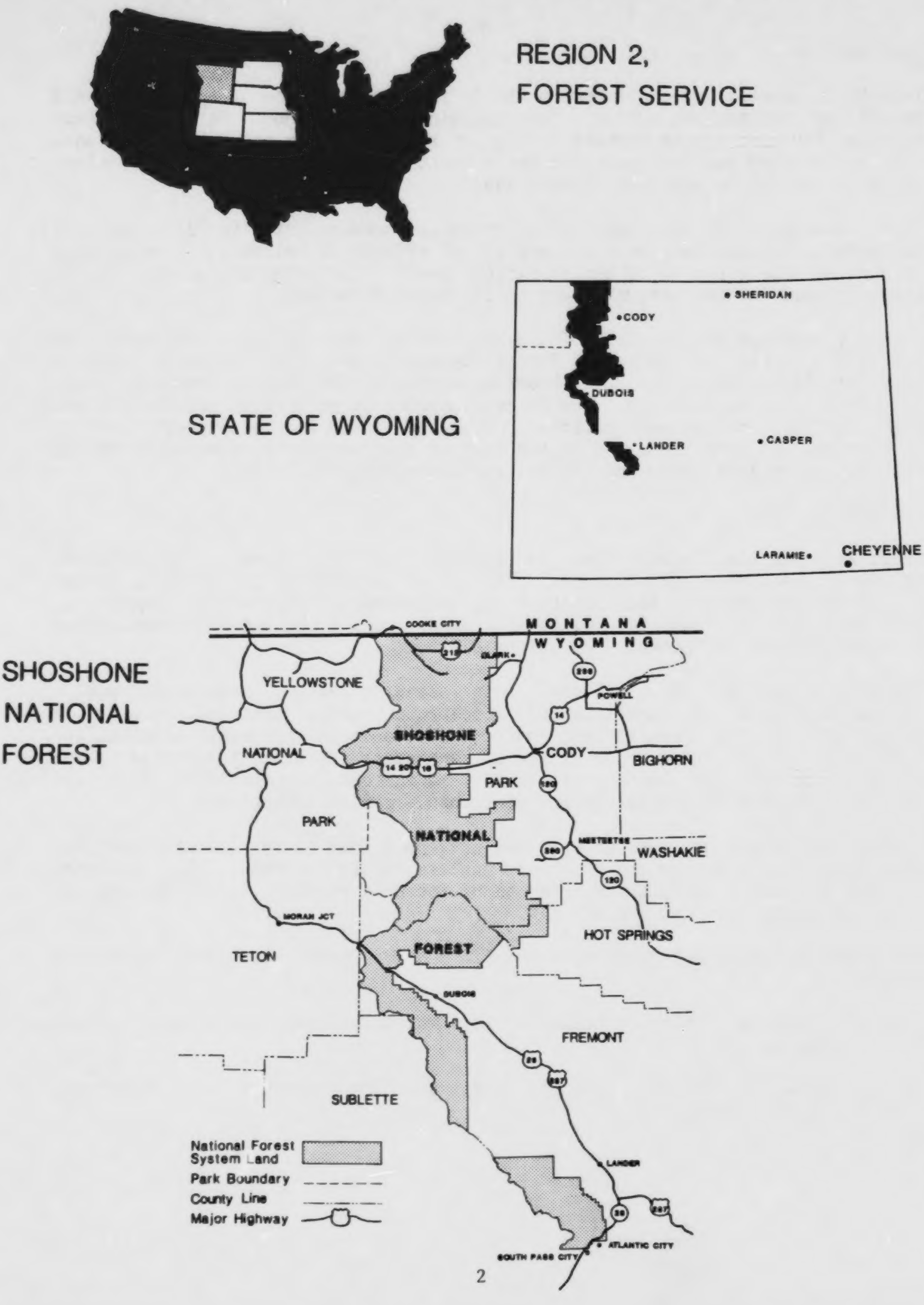
The scoping process that initiated this planning effort identified public issues (subjects or questions of widespread public interest relating to management of the Forest) and management concerns (issues, problems or conditions which affect the range of management practices identified by the Forest Service in the planning process). Management opportunities that are available to address the issues and concerns were also identified.

Issues and concerns were grouped and developed into eleven planning problems that the proposed action and its alternatives would address. The planning problem statements and the requirements of the NFMA regulations established the scope of the Forest Plan and the EIS.

The planning problems addressed in the EIS and the Forest Plan are summarized below:

1. Balanced timber management for multiple resource and local economy needs.
2. Adequate variety, amount, dispersion and quality of recreation opportunities.

FIGURE 1 Vicinity Map



REGION 2,
FOREST SERVICE

STATE OF WYOMING

SHOSHONE
NATIONAL
FOREST

SHERIDAN
CODY
DUBOIS
LANDER
CASPER
LARAMIE
CHEYENNE
COOKE CITY
MONTANA
WYOMING
212
CLARK
296
POWELL
14
YELLOWSTONE
NATIONAL
PARK
SHOSHONE
NATIONAL
FOREST
14 20
16
CODY
BIGHORN
PARK
120
MEETEETSE
290
WASHAKIE
120
MORAN JCT
TETON
HOT SPRINGS
DUBOIS
FREMONT
26
287
SUBLETTE
LANDER
28
287
ATLANTIC CITY
SOUTH PASS CITY
National Forest System Land ▨
Park Boundary
County Line
Major Highway

3. Adequate level and kind of livestock grazing while meeting multiple resource needs.

4. Manage wilderness to best satisfy legal requirements and public needs.

5. Adequate level of road and trail system development and maintenance.

6. Adequate levels and quality habitat for wildlife and fish in response to increasing demands and expanding competition from other resource uses.

7. Manage threatened and endangered species habitat to achieve recovered populations of those species.

8. Adequate quality, quantity and timing of water yields for Forest and non-Forest uses and other downstream uses off the Forest.

9. Adequate and appropriate fire management.

10. Adequate level of rights-of-way acquisition, land adjustments and special land uses.

11. Mineral exploration, development and extraction at levels compatible with other resource values and uses.

CHANGES BETWEEN DRAFT AND FINAL EIS

Based on comments received during the public comment period, a new benchmark was added and all alternatives were reformulated and analyzed. The new benchmark maximized the amount of wilderness on the Forest. This had been done in original analysis but was deleted when the Wyoming Wilderness Act was passed in 1984. Discussions of benchmarks in Chapter II and Appendix B of the EIS have been updated accordingly.

The major analysis questions dealt with oil and gas considerations, timber harvest, and roads associated with timber harvest. Upon examination of procedures used for including oil and gas leasing and operations in analysis, no change to the procedures was indicated. However, discussions throughout Chapters II, IV, and Appendix B of the EIS were rewritten to clarify and address the questions related to this area.

When the analysis procedure for timber was examined, a change in procedure was indicated. This was in the area of accounting for roads associated with timber harvest. The change in procedure resulted in a need to reanalyze the maximum present net values benchmark and all alternatives. This reanalysis resulted in a general decrease in the acres managed for timber, a decrease in road needs, and a decrease in the long-term sustained yield levels for timber. Timber harvest levels for the next ten years did not change significantly in any alternative, however. Changes were made to Chapter II and IV, and Appendices B and C in the EIS; as well as to Appendices A, B, C, and D in the Plan based on this new analysis of timber.

Reformulation and analysis of alternatives affected many other resource areas as well. In most cases, the changes were not significant. Both the EIS and

Plan were extensively revised to incorporate those changes and to clarify points that appeared to cause confusion. In chapters where significant changes have been made, these changes are discussed in the chapter introduction.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Each of the following alternative descriptions includes a statement of the philosophy which guided the formulation of the alternative and highlights the salient features of the alternative. An alternative is composed of a specific FORPLAN prescription for each analysis area on the Forest. A FORPLAN prescription is a set of integrated management practices, having a general multiple use emphasis, that is applied to a unique sub-area of the Forest (analysis area). [FORPLAN is a linear program model used in Forest planning.] A range of such prescriptions from commodity emphasis to amenity emphasis was developed for each analysis area. The FORPLAN prescriptions chosen for an alternative depend on the overall emphasis of the alternative.

The description of alternatives presented here is a Forest-wide perspective. The individual prescriptions for each analysis area under each alternative are retained in the planning records. Appendix J of the Forest Plan contains prescription descriptions for the preferred alternative.

All alternatives currently reflect the provisions of the Wyoming Wilderness Act of 1984 dealing with the Shoshone National Forest. This Act provides for maintaining the wilderness character of a portion of the High Lakes Area for later study of its suitability for wilderness designation. It provides that the Dunoir Special Management Area shall continue to be managed according to P.L. 92-476, which retains its wilderness character. The Act also designated the Popo Agie Primitive Area as wilderness, and added about 142,000 acres to existing wildernesses.

Recommendation for designation of Wild and Scenic Rivers will not be made in any alternative. The Clark's Fork of the Yellowstone River has been recommended for designation in a final EIS and has been administratively endorsed, but Congress has yet to act on the recommendation. Wiggin's Fork of the Wind River was examined for potential as a study river, but was determined to be ineligible for inclusion (the eligibility report is in Appendix E of this EIS).

In all alternatives, most of the Forest outside wilderness is available for mineral leasing under the Mineral Leasing Law. Specific decisions, particularly in regard to surface occupancy, will be made on a case-by-case basis. Designated wilderness is withdrawn from mineral leasing and entry except for verified existing rights.

A range of management alternatives was developed so the management strategy with the largest net public benefit could be selected to guide management of the Forest over the planning horizon (through the next five decades). Each alternative addresses the planning problem in a different way. Following is a summary of the six alternatives considered in detail in this EIS.

Alternative A (Current Direction - No Action)

This alternative is designed to depict the effects of managing the Forest under goals and objectives of existing plans and policies. This provides a basis for comparing all other alternatives. It is also the no-action alternative as required by NEPA for it depicts what would happen if no action were taken to change the current management direction on the Forest. This alternative was formulated by creating FORPLAN prescriptions for each analysis area that portray implementation of current plans and policies and requiring FORPLAN to select these during analysis.

Distribution of recreation opportunities and types of recreation opportunites available would remain the same as is currently available. No new developed or dispersed recreation facilities would be constructed. Range management would be guided by existing allotment plans and all range currently available to domestic livestock would remain available. Timber harvest would be done as it has been over the last 5 to 10 years with standards allowing for the legal maximum in terms of cut block size and distribution. The suited land base would drop about 3 percent from the 1976 Timber Management Plan; however, the allowable sale quantity increases by about 10 percent above that indicated in the 1976 Timber Management Plan. Road construction and reconstruction would stay about the same as over the last 10 years with the same proportion of roads closed, open and seasonally controlled. Wildlife habitat improvements would continue, using treatments specifically designed for wildlife, as would contination of timber harvests, range management and seasonal road closures to protect and enhance habitat. Oil and gas leasing and operations would be allowed under stipulations and operating standards selected to insure that minimum legal standards for surface resources are met.

Alternative B (Commodity Emphasis)

This alternative was formulated to address a set of issues and concerns requesting a high level of production of commodity-oriented goods and services. This includes a high level of timber production, a high level of production of forage for domestic livestock, and high levels of developed recreation opportunities, including lodges and outfitters and guides. Also, to meet the commodity intent, stipulations and probable operating standards for oil and gas were kept at levels to meet legal minimum standards only and thereby provide the least restrictive environment for such operations.

Issues and concerns for which this alternative was designed include providing a maximum upward impact on declining local economies, increasing revenues to the U.S. Treasury, increasing revenues to local economies, and facilitating to the extent possible, exploration and development of domestic reserves of oil and gas.

This alternative was created by setting minimum production requirements for timber and forage for domestic livestock. Also included was a minimum production level for developed recreation that would meet or exceed developed recreation demand on all Ranger Districts. Finally, stipulations and probable operating standards for oil and gas leasing and operations were set to provide only for legal minimum standards on soil, water, air, and threatened and endangered species.

Alternative C (Noncommodity Emphasis)

This alternative was formulated to address a set of issues and concerns calling for a limitation on commodity production on the Forest. Such comments requested less timber harvest (from none to about 8 MMBF per year), less grazing of domestic livestock, and a curtailment of oil and gas leasing and operations on the Forest. Issues and concerns for which this alternative was designed include protection of the greater Yellowstone area, and protection of visual quality, high quality recreation experiences, water quality, wetlands and wildlife including threatened and endangered species.

This alternative was formulated using input provided by representatives of the Sierra Club and Greater Yellowstone Coalition. Management strategies selected in the amenity benchmark were modified and formed the basis of those strategies chosen for this alternative. Preliminary analysis of this alternative provided timber production at a level which maximized economic efficiency. This level was higher than that which would meet the intent of this alternative, so an upper limit on timber production for the first 10 years was provided.

This alternative departs significantly from current direction in a number of ways. It provides greater emphasis on nonwilderness, nonmotorized recreation. It significantly decreases forage available for domestic livestock, simultaneously increasing forage for wildlife. It also decreases timber production. Stringent stipulations and operating standards for oil and gas would ensure protection of visual, recreation and wildlife resources, and decrease risks to soil, water, and air resource values.

Alternative D (Preferred)

This alternative was designed to maximize net public benefits by balancing production of commodities and amenities in response to issues and concerns. The philosophy of this alternative is to emphasize amenity values while producing commodities at historic levels. This philosophy was developed through a comprehensive examination of benchmarks and their results, preliminary alternatives, and other final alternatives. As such, it combines features of Alternatives B and C, the maximum PNV benchmark, the amenity benchmark, and the District Rangers' alternative which was eliminated from detailed study.

Issues and concerns for which this alternative was designed include: maintaining viability of ecosystems on the Forest in recognition of their role in the greater Yellowstone area; providing high quality, low density recreation; meeting production needs of existing dependent commercial operations including timber, ranching, outfitting and guiding and recreation based sectors; increasing public access to the Forest; protecting and enhancing soil, air and water resources; improving wildlife habitat; and providing for oil and gas leasing and operations in a way that will blend these operations with the physical and biological features of this Forest.

This alternative was created by setting minimum production levels for each type of recreation opportunity, by Ranger District. These production levels favor high quality, low density types of recreation. Also standards and guidelines for timber harvest, grazing of domestic livestock and oil and gas leasing were included to blend these operations with amenity values, according to the management philosophy of this alternative.

Alternative E (Reduced Budget)

Given the budget problems of the Federal government over the last several years, this alternative was created to address the concern regarding what would happen if the budget of the Forest were reduced by 25 percent from its fiscal year 1982 level. This alternative was formulated by placing an upper limit on the budget for the first decade to reflect the 25 percent reduction from the fiscal year 1982 level. Also, based on examination of the 25 percent reduced budget benchmark, which produced little timber, a minimum level of timber production was imposed to make this alternative realistic.

All areas that are available for leasing in every other alternative are also available in this alternative. Stipulations for leasing and probable operating standards for leasing and subsequent operations are the same as in Alternatives A, B, and F.

Alternative F (RPA)

This alternative is designed to identify the costs and effects of meeting the Forest's share of National production of goods and services, as disaggregated in the RPA program. This alternative was required because none of the other alternatives meet the target for forage for domestic livestock given in RPA targets. (A number of alternatives meet or exceed RPA targets for timber and recreation.)

The major difference between this alternative and current direction is that forage for domestic livestock would be increased. This would be accomplished on slightly fewer acres through more intensive range management practices. Other differences include an increase in acres treated to improve wildlife habitat and a decrease in timber production.

There are no significant differences in the set of issues and concerns addressed by this alternative and those addressed by Alternative A.

ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY

All benchmark or resource maximization runs of the planning model could be considered as alternatives. However, none were analyzed as alternatives considered in detail because each tended to focus on a select issue rather than a majority of the issues. Features of the various benchmarks that fulfill legal requirements or respond to issues and concerns are retained in the alternatives studied in detail.

Three alternatives were considered but eliminated from further study. Elements of each were incorporated into one or more alternatives that are analyzed in detail. The alternatives eliminated from detailed study are:

> Preliminary Noncommodity Alternative. This alternative was created by incorporating prescriptions that provide water yield increases, optimize recreation opportunities, emphasize wildlife forage and reduce the risk of watershed impacts.

District Ranger's Alternative. This alternative was formulated by allowing each District Ranger to choose the FORPLAN prescription he feels is best suited to manage each analysis area on the District. The choice was independent of any Forest-wide strategy for management.

Sierra Club/Greater Yellowstone Coalition Alternative. Acting cooperatively, the above interest groups inspected the FORPLAN prescriptions and the benchmarks. They submitted recommendations for particular analysis areas based on this review. This did not comprise a complete alternative and so their recommendations were used in concert with the preliminary noncommodity alternative to develop Alternative C.

RESPONSE OF ALTERNATIVES TO ISSUES, CONCERNS AND OPPORTUNTIES

Each of these alternatives responds to the issues, concerns and opportunities (planning problems) in a particular way. These responses are summarized in terms of Forest outputs and activities in Tables 2 and 3. Table 1 provides a detailed narrative response to planning problems, by alternative. References are made for each problem to specific items in Tables 2 and 3 that best illustrate the differences in response between alternatives. The response to a planning problem is generally regarded in a long term sense, because the achievement of a desired Forest condition may require up to five decades of programmed effort. Table 3, which presents the 50 year average for quantified outputs, activities and effects, is therefore very appropriate for illustrating response by alternative.

Also given in Table 1 for each planning problem is a summary which includes discussion of management direction that does not change by alternative. This is a recognition of standards and guidelines that provide minimum acceptable resource protection regardless of the emphasis of an alternative.

It should be noted that a measured output, effect, activity or applied standard would generally respond to more than one planning problem. It is a principle of National Forest management to attempt to deal with and satisfy a multiplicity of resource needs in an integrated manner.

COMPARISON OF ALTERNATIVE OUTPUTS

Table 2 displays the average annual outputs, activities and effects that would result from each alternative in the first decade. Table 3 displays the average annual outputs, activities and effects that would result from each alternative over the planning horizon (through 2035).

TABLE 1

Comparison of Alternative Responses to Planning Problem Statements

Planning Problem #1	How can timber management be balanced to meet other resource needs and contribute to a healthy local economy.
Related Outputs and Activities (See Tables 2 and 3)	Suitable Acres Planting (Reforestation) Selection Cut Overstory Removal Poletimber Harvested Sawtimber Harvested Preservation Visual Quality Partial Retention Visual Quality Maximum Modification Visual Quality Clearcut Harvest Commercial Thinning Seedcut Timber Stand Improvement Fuelwood Visuals Rehabilitation and Enhancement Retention Visual Quality Modification Visual Quality
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein for the attainment and maintenance of a healthy forest environment from a variety of resource standpoints. In particular, such direction is found under: Diversity on National Forests; Wild and Scenic River Management; Visual Resource Management; Wildlife Habitat Improvement and Maintenance; Silvicultural Examination and Prescription; Reforestation; Riparian Area Management; Water Resource Improvement and Maintenance; Soil Resource Management; and Fuel Treatment. General Forest Direction is also provided under Insect and Disease Management/Suppression. Such Direction and standards tend to be broad to allow actual management to be tailored to fit specific circumstances given the philosophy of an alternative. Alternatives C and D call for timber operations Direction and standards using interpretations that will favor wildife, visuals and recreation. Projected average annual sawtimber demand increases from 12 to 14 million board feet over the next 50 years. All alternatives except C and E approach this level of demand in allowable sale quantity. Alternative B produces the most sawtimber over the planning horizon at 12.1 million board feet annually. The long term sustained yield level of Alternatives A, B, D and F exceed the 14 MMBF level, but won't reach this level until about the 15th decade. By that time demand may have increased beyond this.
Comparative Response by Alternative	
A (Current Direction - No Action)	Timber harvest levels would be programmed at or above the average for the last five years. Acres under timber management would decrease from the 1976 Timber Management Plan to 89,000 acres. Programmed sales would increase by 0.7 million board feet per year to an average annual 11.2 MMBF of sawtimber. Areas of low water quality would be improved as more and more activities are carried out with appropriate standards and guidelines. Visual quality rehabilitation and enhancement activities would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modification categories by 24 percent.
B (Commodity)	Timber output would be increased significantly above the level set in the 1976 Timber Management Plan. The amount of timber land defined as suitable would increase by about 12,500 acres from the 1976 Timber Management Plan to 106,000 acres. Annual programmed harvest would rise by 1.6 million board feet to 12.1 MMBF.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

B (Commodity) (Continued)	This level of harvest would help reduce insect and disease problems by harvesting more of the mature and over-mature timber. Due to increased roading and timber harvest, water yield and peak flow would both increase which would reduce water quality. This effect would be slight Forest-wide, but may be significant in some areas. The increased timber harvest level would cause more of the Forest to be managed for earlier successional stages of vegetation. This increase would aid in meeting wildlife population targets. Visual quality rehabilitation and enhancement activities would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modificiation categories by 30 percent.
C (Noncommodity)	Programmed timber sales offered would drop to around 85 percent of the average annual harvest for the last five years and to 70 percent (8.6 MMBF) of the average annual sales offered under current management. In selected areas, timber cutting would be carried out in a manner designed to increase water yield. Acres under timber management would decrease from the 1976 Timber Management Plan to 71,000 acres. With lower annual harvest levels, the risk of insect and disease problems would be increased as existing mature and over-mature timber remains unharvested. Increases in water yield and the enhancement of summer runoff resulting from this alternative could not be considered significant. In selected areas, water quality improvement would be significant, though Forest-wide there would not be much improvement over current levels. Visual quality rehabilitation and enhancement activities would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modification categories by 20 percent.
D (Preferred)	Programmed timber sales would remain near current levels at an annual average of about 10.7 million board feet over the planning horizon. Timber management would be planned on about 8,000 acres less than in the 1976 Timber Management Plan or 85,400 acres. The mix of clearcut, shelterwood and selection systems would be about the same as current direction and timber yield would be about 0.2 million board feet higher than that under the 1976 Timber Management Plan. With this alternative, there would be a significant increase in vegetation manipulation to improve wildlife habitat. This would provide more areas in early successional stages than is currently planned. Water quality in some areas of the Forest would be improved over conditions under current management. Visual Quality rehabitation and enhancement activites would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modification categories by 30 percent.
E (Reduced Budget)	Programmed timber sales would drop to 27 percent of current levels to 2.8 million board feet per year. Water yield and peak flows would drop due to decreased roading and timber harvest. Timber management in this alternative occurs on 24,700 acres compared to the present 93,500 acres. Water quality Forest-wide would remain near current levels. In some areas, water quality would be maintained over current trends due to road closures and decreased timber related activities; in other areas, water quality would decrease due to lower levels of monitoring and administration, reflecting lower management standards. Vegetation Forest-wide would tend to be in

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

E (Reduced Budget) (Continued)	late successional stages, which would affect wildlife species diversity, visual diversity, and the incidence of forest insect and disease problems. Visual quality rehabilitation and enhancement activities would be carried out to a lesser degree than in all other alternatives, primarily because of the decreased need for them under a reduced timber program. Total acres in the modification and maximum modification categories would be reduced 30 percent over the planning horizon.
F (RPA)	Programmed timber sales would be slightly below those in the 1976 Timber Management Plan with an annual allowable sale quantity of about 10.4 million board feet over the planning horizon. Timber management would occur on 82,900 acres, which is about 10,000 less than the suitable base under the 1976 Timber Management Plan. Areas contributing to lower water quality would generally improve as activities are carried out with appropriate standards and guidelines. Visual quality rehabilitation and enhancement activities would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modification categories by 28 percent.
Planning Problem #2	Providing an adequate variety, amount, dispersion and quality of recreation opportunities amid the inherent conflicts between Forest uses.
Related Outputs and Activities (See Tables 2 and 3)	Developed Public Recreation RVD's Facility Construction and Reconstruction Dispersed Motorized RVD's Primitive Nonwilderness Acres Roaded Natural Acres Rural Acres Acres Open to Snowmobiles Acres Closed to Snowmobiling See also Visual Quality Objectives under Planning Problem #1 Developed Private Recreation RVD's Downhill Skiing RVD's Nonmotorized RVD's Wildlife and Fish RVD's Semiprimitive Motorized Acres Dispersed Facility Construction and Reconstruction Acres Restricted to Snowmobiling Semiprimitive Nonwilderness Nonmotorized Acres
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein to minimize conflicts between recreation uses and other Forest uses, and between conflicting recreation uses. In particular, such direction is found under: Visual Resource Management; Management of Developed Recreation sites; Dispersed Recreation Management; Recreation Management (Private and Other Public Sectors); Wilderness Area Management; and Trail System Management. A complete spectrum of recreation opportunities: dispersed recreation, developed public and private recreation (including skiing), are provided in every alternative. Variation between alternatives is provided by differing emphasis on particular kinds or qualities of recreation. The Forest's capacity to accomodate most recreation uses is greater than the anticipated demand for those uses. Though Yellowstone National Park has not identified their capacity for developed recreation which could impact demands for such recreation on the Forest, it appears that demands for developed recreation will be met in all alternatives except Alternative E.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	The greatest amount of nonwilderness recreation in terms of RVD's is provided in Alternatives C and D. Developed public and private recreation is greatest in Alternative B, but is not significantly greater than in Alternative D. All alternatives produce recreation opportunites at or near the maximum which would be consumed. Alternative D provides the most motorized access to the Forest for recreation. Alternative C produces the most nonmotorized recreation.
Comparative Response by Alternative	
A (Current Direction - No Action)	Distribution of recreation opportunities and type of recreation opportunities available would remain the same as is currently available on the Forest. No new developed or dispersed recreation facilities would be constructed. All existing developed and dispersed recreation areas would be managed at acceptable levels to provide the same recreation experiences as in the past. The current mix of recreation opportunities would be provided both in and out of wilderness. Visual quality would deteriorate somewhat as timber operations and oil and gas production are carried out under minimum standards. This may not affect a significant portion of the Forest, but may be dramatic in some areas.
B (Commodity)	For this alternative, developed recreation production was set to meet or exceed demand on each Ranger District. Dispersed recreation opportunities are also provided at levels which exceed the amount that will be consumed. Visual quality may be slightly less than under Alternative A because of a slight decrease in visual standards for oil and gas operations in some areas on the Forest. Production of commodity goods and services including developed recreation would be higher than current levels. All developed recreation areas currently available would remain open and the amount of reconstruction of recreation areas would be increased. Nonwilderness recreation opportunities would increase for all forms of recreation compared with Alternative A, though the mix will remain about the same. In wilderness, there would be a shift from both pristine and semiprimitive recreation experience to more primitive recreation opportunities. This shift means that more areas will have low density trails and level of use will be dispersed and would decrease slightly than under Alternative A. Enough wilderness recreation opportunities would be provided to meet expected increases in use. The visual quality would deteriorate somewhat as timber operations and oil and gas production are carried out under minimum standards. This may not affect a significant portion of the Forest, but may be dramatic in some areas.
C (Noncommodity)	This alternative would provide sufficient amounts of different types of recreation opportunities to satisfy demand on each Ranger District. Developed recreation capacity would decrease slightly from that which would be produced under Alternative A, but expenditures for construction/reconstruction of developed facilities would increase slightly compared with Alternative A. The Forest would be less accessible for motorized recreation due to the number of roads closed year-long rather than seasonally. Under this alternative, developed récreation capacity would drop slightly, but the quality of recreation experience offered would be about the same as in Alternative A.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

C (Noncommodity) (Continued)	There would be a significant increase in all nonwilderness dispersed recreation and the amount produced is higher than all other alternatives. Visually, the Forest would improve in appearance over Alternative A through time. This is due to more restrictions on oil and gas operations, and standards on timber harvest which emphasize visual quality. Thus, the amount of timber management is lower than in Alternative A and the effects of such management are not as visually evident. The mix of wilderness recreation opportunities would not change significantly from those provided in Alternative A; there would be a slight shift toward semiprimitive recreation opportunities.
D (Preferred)	This alternative would provide sufficient amounts of different types of recreation opportunities to satisfy demand on each Ranger District. Developed recreation capacity and construction/reconstruction expenditures would increase compared with Alternative A. Dispersed recreation capacity would be increased from Alternative A with construction/reconstruction expenditures dropping slightly. Developed recreation would be produced at levels slightly higher than Alternative A and maintenance of recreation facilities would be to a higher standard. Dispersed recreation capacity would increase greatly over Alternative A. The acres allocated to different recreation opportunities would be changed slightly, becoming more balanced when maintained or enhanced through management. All management activities would be planned to meet high visual standards. This, coupled with an increase in nonmotorized recreation areas and improved wildlife habitat, would reduce the impact of the sights and sounds of man from Alternative A. There would be a slight change in wilderness recreation opportunities when compared with Alternative A. These would be a slight shift toward pristine and primitive recreation, attended by a decrease in semiprimitve opportunities.
E (Reduced Budget)	Developed recreation capacity would drop 15 percent while developed recreation construction/reconstruction expenditures drop 17 percent. This shows a decrease in quality of the developed recreation use over time compared with Alternative A. Because of lower amounts of trail maintenance, reduced access, and lower expenditures for recreation use management, the recreation experiences offered would shift toward experiences of low quality. The same would be true of wilderness opportunities provided. Visual quality would be the lowest in this alternative and would deteriorate through time.
F (RPA)	For this alternative, developed recreation production was set to meet or exceed demand on each Ranger District. Dispersed recreation opportunities over time would be similar to those provided in Alternative A. Developed recreation capacity would be provided at about the same level as in Alternative A and at about the same quality. Dispersed wilderness recreation use capacity would increase from Alternative A with a shift from primitive to semiprimitive recreation opportunities. Dispersed nonwilderness recreation use capacity would increase significantly over Alternative A with dispersed facility construction/reconstruction expenditures increasing slightly compared with Alternative A.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Planning Problem #3	Providing for adequate levels and kinds of livestock grazing in view of other resource needs and uses.
Related Outputs and Activities (See Tables 2 3)	Cattle Forage Sage Management Acres Range Improvement - Fencing Acres of Range Suitable and Open Sheep Forage Noxious Weed Treatment Acres Range Improvements - Other
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein to minimize conflicts between livestock grazing and other Forest uses and resource needs. In particular, such direction is found under: Wilderness Area Management; Range Resource Management; Range Improvement and Maintenance; and Riparian Area Management. Alternative F provides the highest level of grazing use, but produces at a level well above what is considered adequate in terms of demand. Alternatives A, B, D, and F all provide for total grazing at levels above the current stocking, but differ significantly in regard to sheep numbers. Alternative D de-emphasizes sheep in response to the local market trend. The reduced budget alternative provides the least forage for domestic cattle. Alternative C provides a level of stocking below the current permitted, but near the currently stocked numbers. Under all alternatives compared to A, slight decreases in intensive range management activities, water developments, fencing and sagebrush treatment would occur because of decreases in open range for cattle. Reductions in permitted livestock numbers Forest-wide would be required initially in Alternatives C and E. While Alternatives A, B, D, and F would not decrease permitted domestic livestock numbers Forest-wide, reductions in numbers would occur on some allotments to provide for wildlife forage needs and to adjust stocking levels to meet existing capacities. Conversely, upward adjustments would be available on some allotments that are presently stocked below existing capacities for domestic livestock. Total current permitted livestock, Forest-wide is about 77,100 AUM's.
Comparative Response by Alternative	
A (Current Direction - No Action)	Range management would be guided by existing allotment plans. Most of the range suitable for domestic livestock would be available for term grazing permits. The remainder would be available for use by transportation livestock and wildlife. Suitable and open range used by livestock would comprise about 2[illegible]2,000 acres of the Forest. Range condition would improve over the next 50 years until all range is in good condition. Because of this increase in range condition, grazing capacities would be increased 34 percent above current permitted numbers, Forest-wide.
B (Commodity)	Range production capacity would be significantly higher than current consumption. Suitable and open range used by livestock would comprise about 256,000 acres of the Forest. By the end of the planning horizon, grazing capacities would be increased 36 percent above current permitted numbers, Forest-wide; this is two percent greater than the final capacity achieved under current direction. Range condition would improve over the next 50 years until all range is in good condition.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

C (Noncommodity)	Domestic livestock grazing capacity would be provided at about 99 percent of current capacity levels by the end of the planning horizon. Suitable and open range used by livestock would comprise about 204,000 acres of the Forest. This is 26 percent less than the final capacity achieved under Alternative A. In some areas improvement of range condition would occur at a faster rate than under Alternative A. Not all suitable range would be used for domestic livestock grazing, and many areas of suitable range would be grazed below capacity. Because of the location of suitable range on the Forest, most of this decrease in use by livestock would be in wildlife summer range.
D (Preferred)	Suitable and open range used by livestock would comprise about 260,000 acres of the Forest. By the end of the planning horizon, grazing capacities would be increased 32 percent above current permitted numbers, Forest-wide; this is one percent less than the final capacity achieved under Alternative A. Range would be managed much the same as under Alternative A with a few areas where grazing systems and scheduled range improvements will change. There will be a shift in the mix of livestock grazed with the number of domestic sheep dropping with comparative increases in cattle. This is in response to current shifts in demand.
E (Reduced Budget)	Domestic livestock grazing would drop to 46 percent of current capacity in the first decade following implementation. Suitable and open range used by livestock would comprise about 80,000 acres of the Forest. By the end of the planning horizon, grazing capacities would be 54 percent of the current permitted numbers, Forest-wide; this is about 60 percent less than the final capacity achieved under Alternative A. Suitable range would move toward good condition, but less intense management of these lands would allow later successional stages to predominate and could lead to a decrease in suitable range because of invasion of undesirable range species.
F (RPA)	Most range suitable for domestic livestock would be managed intensively with many improvements. Suitable and open range used by livestock would comprise about 261,000 acres of the Forest. By the end of the planning horizon, grazing capacities would be 40 percent above current permitted numbers, Forest-wide; this is 5 percent greater than the final capacity achieved under Alternative A. This increase over Alternative A is achieved through more intense management of suitable range and includes an increase in forage available to wildlife. Suitable range would improve until all range is in good condition.
Planning Problem #4	Management of wilderness areas to best satisfy legal requirements and public needs.
Related Outputs and Activities (See Tables 2 and 3)	Dispersed Wilderness RVD's Primitive Wilderness Acres Pristine Wilderness Acres Semiprimitive Wilderness Acres
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein to manage wilderness within legal requirements, and at a level of quality that basically meets public needs. In particular, such direction is found under: Wilderness Area Management; Dispersed Recreation Management; and Recreation Management (Private and Other Public Sectors). If recreation use exceeds capacities established for any specific management area

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	within a wilderness, management actions to reduce unacceptable use levels could consist of road (wilderness access) and trail restrictions or closures, permit systems or other management actions. Wilderness and Wilderness Study Area acres do not vary by alternative. An appropriate mix of wilderness recreation opportunities and settings is provided in all alternatives except E, where they devolve toward semiprimitive. Alternative D produces the most pristine wilderness, Alternative B the most primitive, and E the most semiprimitive. The general balance and distribution of the opportunity classes remains the same in Alternatives A, B, C and D. In Alternatives E and F more acres are managed for semiprimitive opportunities and less for primitive. Alternative E represents the probable effect of long term wilderness management with a reduced budget; primitive opportunities would be reduced to semiprimitive due to less control of wilderness access and less administrative contact with users. All alternatives except E meet the intent of the Wilderness Act.
Comparative Response by Alternative	
A (Current Direction - No Action)	Dispersed wilderness recreation visitor days would be expected to increase above current use to 206 MRVD's over the first 10 years. Pristine wilderness recreation recreation opportunities would be available on about 11 percent of the total Forest wilderness system; about 53 percent would provide primitive wilderness opportunities; and the remaining 36 percent would be semiprimitive.
B (Commodity)	Dispersed wilderness recreation visitor days would be less in this alternative compared with Alternative A, at 200 MRVD's. Pristine wilderness recreation opportunities would be available on 10 percent of the total Forest wilderness sytem; 56 percent would provide primitive wilderness opportunities; and the remaining 34 percent would be semiprimitive. This is a shift toward primitive opportunities compared to Alternative A.
C (Noncommodity)	Dispersed wilderness recreation visitor days would be expected to increase more in the first decade compared with Alternative A, to a level of 230 MRVD's. Pristine wilderness recreation opportunities would be available on less than 10 percent of the total Forest wilderness system; 51 percent would provide primitive wilderness opportunties; and the remaining 39 percent would be semiprimitive. This is a shift from pristine and primitive opportunities to semiprimitive opportunities compared with Alternative A.
D (Preferred)	Dispersed wilderness recreation visitor days would be exceed current use but would rise to only 196 MRVD's in the first 10 years. Pristine wilderness recreation opportunities would be available on 12 percent of the total Forest wilderness system; about 53 percent would provide primitive wilderness opportunities; and the remaining 35 percent would be semiprimitive. This shows a slight shift toward pristine and primitive recreation opportunities compared with Alternative A.
E (Reduced Budget)	Dispersed wilderness recreation visitor days' and quality would be expected to increase less in the first decade compared with Alternative A.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

E (Reduced Budget) (Continued)	Pristine wilderness recreation opportunities would be available on 10 percent of the total Forest wilderness system; 41 percent would provide primitive wilderness opportunities; and the remaining 49 percent would be semiprimitive. This is a shift toward semiprimitive opportunities compared with Alternative A, but because of reduced expenditures in this alternative, these opportunities will degenerate to low quality recreation opportunities.
F (RPA)	Dispersed wilderness recreation visitor days would be expected to increase in the first decade more than in Alternative A, to a level of 220 MRVD's. Pristine wilderness recreation opportunities would be available on 11 percent of the total Forest wilderness system; 48 percent would provide primitive wilderness opportunities; and the remaining 41 percent would be semiprimitive. This represents a shift toward semiprimitive opportunites compared with Alternative A.
Planning Problem #5	Providing an adequate level of road and trail system development and maintenance.
Related Outputs and Activites (See Tables 2 and 3)	Road Maintenance - Total Miles Miles of Roads Obliterated Miles of Road Closed Miles of Road Open Miles of Trail Maintenance and Reconstruction Miles of Road Construction and Reconstruction Miles of Road Controlled Miles of Trail Construction See also Timber and Recreation-related outputs.
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein to maintain roads and trails, and the transportation system in general, at standards commensurate with expected types and quantities of use. In particular, such direction is found under: Transportation System Management; Arterial and Collector Road Construction and Reconstruction; Local Road Construction and Reconstruction; Road Maintenance; Trail System Management; and Trail Construction and Reconstruction. Roads and trails would be constructed or reconstructed under all alternatives to meet recreation and timber goals and objectives. Road closure, road obliteration and road control also occurs under all alternatives. What is judged as an adequate level of transportation system development is variable by the emphasis of the alternative in question. The road and trail system does not change appreciably by alternative, except in Alternative E where about one third of the roads and over half the trails would be abandoned during the first 10 years.
Comparative Response by Alternative	
A (Current Direction - No Action)	**This alternative calls for new road construction of 76 miles of road in the next 10 years and obliteration of 48 miles. It calls for 40 percent of the roads to be open all year to the public, 54 percent would be controlled with seasonal closures and the remaining 6 percent would be closed to public use. It provides for a net increase in roads of about 165 miles of road by the end of the next 50 years for a total road system of 1,614 miles.**

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

A (Current Direction - No Action) (Continued)	About 69 miles of new trail are projected to be constructed, bringing the trail system to a total of 1,363 miles by the end of the next 50 years.
B (Commodity)	This alternative provides for construction of 66 miles of road in the next 10 years and obliteration of 48 miles. The road system would have 4 percent fewer miles than Alternative A. On the average over the planning horizon, about 41 percent of the roads will be open all year for public access; 42 percent will be controlled using seasonal closures; and 17 percent will be closed year round to the public. This represents a significant shift in road management when compared with current direction. It provides for a net increase in roads of 107 miles by the end of the planning horizon. About 33 miles of new trail are projected to be constructed over the next 50 years, bringing the trail system to a total of 1,330 miles.
C (Noncommodity)	This alternative provides for 71 miles of new road construction and 48 miles of road obiliteration over the next 10 years. Over the planning horizon, about 42 percent of the roads will be open all year to the public; 38 percent will be controlled seasonally; and 20 percent will be closed year round. This represents a shift to more road closures than in Alternative A and fewer roads with seasonal restrictions over the long term. This alternative provides for a net increase of 134 miles of road by the end of the planning horizon. Next to Alternative A, this is the greatest increase in roads found in any alternative. About 62 miles of new trail are projected to be added to the trail system in the next 50 years, bringing the trail system to a total of 1,362 miles.
D (Preferred)	This alternative provides for construction of about 66 miles of new road and obliteration of 52 miles of road over the next 10 years. Over the planning horizon, about 41 percent of roads will be open for public use year round, 54 percent will be controlled with seasonal closures, and 5 percent will be closed all year long. This reflects the philosophy of this alternative to disperse recreation use to provide high quality recreation opportunities while protecting soil, water, and wildlife resources. It provides for a net increase of 115 miles of road by the end of the planning horizon. About 64 miles of new trail are projected to be added to the trail system over the next 50 years to provide a trail system of about 1,364 miles.
E (Reduced Budget)	This alternative provides for 10 miles of new road and 25 miles of road obliteration over the next 10 years. There will be an additional decrease in roads during the first ten years as about 500 miles of road will be abandoned. Over the planning horizon 52 percent of the roads will be open all year long, 36 percent will be controlled seasonally and 12 percent will be closed. Over the planning horizon, this alternative provides for a net increase of 75 miles of road, the least of any alternative.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements	
E (Reduced Budget) (Continued)	There will be a 57 percent decrease in maintained trails on the Forest over the first decade, and at the end of 50 years only 29 miles of new trails are projected for construction. At that time the system would consist of 588 miles of trail.
F (RPA)	This alternative provides for 56 miles of new road and 48 miles of road obliteration over the next 10 years. Over the planning horizon 50 percent of the roads will be open year long to the public, 39 percent will be controlled with seasonal restrictions, and 11 percent will be closed year long. Over the planning horizon, it provides for a net increase of 106 miles of roads. About 63 miles of new trail are projected to be added to the system in the next 50 years for a total of 1,330 miles.
Planning Problem #6	Providing adequate levels and quality of wildlife and fish habitat in response to increased competition for those lands by other resource uses.
Related Outputs and Activities (See Tables 2 and 3)	Sage Management Willow Management Aquatic Habitat Improvement Crucial Preferred Winter Range - Deer and Elk Moose Bighorn Sheep Mountain Goat Aspen Management Structural Improvements Wildlife Forage
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein that protects the basic habitat requirements of indicator species on the Forest. In particular, such direction is found under: Wildlife and Fish Resource Management; Riparian Area Management; and Wildlife Habitat Improvement and Maintenance. Other direction, found in management area prescriptions for riparian habitats, indicator species and big game winter range, is applied uniformly in all alternatives. All alternatives provide for sufficient wildlife habitat to meet the on-Forest portions of the State's wildlife population objectives by herd unit as established in 1985, except for the Wapiti Ridge Bighorn Sheep Herd Unit (the South Fork population) and the North Fork Elk Herd Unit. Alternative A provides for only 40 percent of the habitat required to meet the State's bighorn sheep population objective for the South Fork area. None of the alternatives provide for sufficient habitat for the State's North Fork Elk Herd Unit objective. Reduction or elimination of all domestic livestock grazing on all or portions of the allotments within this herd unit would not allow sufficient forage to meet the State's population objective in this herd unit. Over the planning horizon, Alternative C would improve the most habitat on big game winter range and increase the Forest's share of wintering population objectives. Alternative E would provide the greatest amount of forage reserved for wildlife due to reductions in permitted livestock numbers but does not apply measures for improving winter ranges to the extent all other alternatives do. Aquatic habitat would be protected in all alternatives by standards for water quality and riparian area management.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Comparative Response by Alternative	
A (Current Direction - No Action)	Wildlife habitat improvment would neither increase nor decrease substantially. All but two Wyoming and Game and Fish Department population targets for wildlife, would be met. Only 40 percent of the North Fork Bighorn Sheep Herd Unit (South Fork population) could be met and only 57 percent of the North Fork Elk Herd population objective could be achieved. Average annual vegetation treatment for improvement of wildife habitat over the next 10 years would be about 420 acres. Over the planning horizon, average annual treatments decline to about 380 acres. Timber management would provide some benefits to wildlife by improving forage to cover ratios in some areas on the Forest even though for such harvest would not optimize this effect. Minimum standards for protection of wildlife habitat would be included in oil and gas leases, but if major field were developed, there could be significant local impacts on wildlife.
B (Commodity)	Wildlife habitat treatment and wildlife forage would increase in this alternative when compared with Alternative A. Vegetation treatment would average of 521 acres annually over the first 10 years. Over the planning horizon this decreases to about 470 acres per year. When combined with more intensive management of range ecosystems, there would be significant improvement of winter range. Even with these improvements, only 60 percent of the North Fork Elk Herd Unit populations objective could be achieved. The large increase in area managed for timber would improve forage to cover ratios in many areas, even though standards on harvest are not optimum from a wildlife perspective. The effect of oil and gas operations would be the same as in Alternative A.
C (Noncommodity)	Like alternative B, wildlife habitat improvement activities and wildlife forage would both increase substantially over current levels. All but one Wyoming Game and Fish Department population target for wildlife would be met. Only 74 percent of the North Fork Elk Herd Unit population objective could be achieved. Average annual vegetation treatments for improvement of wildlife habitat during the first 10 years would be 518 acres. Over the planning horizon this decreases to an average of 492 acres. Forage available to wildlife increases 70 percent compared with Alternative A. However, most of this increase will be in summer range where there is already adaquate forage. Decreases in timber management in this alternative will lessen the ability of management to improve cover to forage ratios in spring and fall range. However, standards for timber management will optimize positive effects. Also standards on oil and gas activities would minimize impacts on wildlife even if there are major field developments.
D (Preferred)	Wildlife habitat improvement increases significantly when compared with Alternative A. Forage available for wildlife from range suitable for grazing by domestic livestock remains essentially the same as in Alternative A. All population targets including those identified by the Wyoming Game and Fish Department would be met except for the North Fork Elk Herd Unit population objective. Only 63 percent of this target could be achieved. Average annual vegetation treatments for improvement of wildlife habitat during the first 10 years would increase to 552 acres, the highest of all alternatives. Over the planning horizon the average annual treatment would decrease

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

D (Preferred) (Continued)	to about 470 acres. Timber harvest would be only slightly less than in Alternative A and standards for such harvest would optimize its effects on wildlife. Standards on oil and gas operations would be less than in Alternative C, but would be applied with discretion to have the same effect on wildlife as in Alternative C.
E (Reduced Budget)	Wildlife habitat improvement would decrease from current levels. Forage allocated to wildlife would increase substantially from current, primarily in summer range areas which do not represent a limiting factor for big game populations on the Forest. All but one population target, including those identified by the Wyoming Game and Fish Department, would be met; only 92 percent of the North Fork Elk Herd Unit population objective could be achieved. Average annual vegetation improvements for wildlife habitat planned for the first 10 years would treat 309 acres. Over time, a decrease in such treatments (to 102 acres annually), coupled with a decrease in sage treatment for cattle, and decreases in timber management, mean that 99 percent of the forest would be dominated by late successional vegetation. This would favor late-successional dependent wildlife species, such as goshawk and marten, over early-successional and all-age dependent species, such as elk and bighorn sheep. Standards for timber harvest would not optimize the effect of such harvest on wildlife. Standards for oil and gas operations would meet minimum wildlife needs, but could allow significant effects.
F (RPA)	Wildlife habitat treatment needs would increase in this alternative when compared with Alternative A. Forage from range suitable for domestic livestock grazing would be essentially the same as in Alternative A. All population targets including those identified by the Wyoming Game and Fish Department would be met except that only 57 percent of the North Fork Elk Herd Unit population objective could be achieved. Vegetation treatments for wildlife habitat during the first 10 years would improve 498 acres. This would decrease to an average annual treatment of 434 acres over the planning horizon. Timber management would not be done under standards that would optimize its effect on wildlife. Standards for oil and gas operations would have about the same effect as Alternative A.
Planning Problem #7	Management of Threatened and Endangered Species on the Forest and the achievement of recovered populations.
Related Outputs and Activities (See Tables 2 and 3)	Grizzly Bear Situation I Grizzly Bear Situation III Grizzly Bear Situation II Bald Eagle and Peregrine Falcon Habitat
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein for management of threatened and endangered Species, particularly the grizzly bear. Such direction is found under Wildlife and Fish Resource Management, which incorporates by reference the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area." All T&E species are included as management indicators; direction for Management Area 4B, which provides standards and guidelines for indicator species, is applied uniformly through all alternatives. All management is designed to achieve recovered populations.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	Management Area Prescripton 4F is applied in varying degrees in Alternatives B, C and E. This prescription provides for the enhancement of grizzly bear habitat to accelerate the recovery of the bear population.
Comparative Response by Alternative	
A (Current Direction - No Action)	**Grizzly bear habitat would be managed to achieve a recovered population. Habitat needs of the bald eagle, peregrine falcon, black-footed ferret and gray wolf (if reintroduced) would be protected.**
B (Commodity)	Grizzly bear habitat enhancement practices (Prescription 4F) would be applied to about 156,000 acres in grizzly bear Situation I habitat. Such practices would regulate or prohibit human uses in favor of the needs of grizzly bears, to achieve a recovered bear population at an accelerated rate. Practices ensure the minimization of grizzly/human contacts within the prescription area. Habitat needs of the bald eagle, peregrine falcon, black-footed ferret and gray wolf (if reintroduced) would be protected.
C (Noncommodity)	Same as Alternative B, except the grizzly bear enhancement prescription (4F) would be applied to about 13,000 acres of Situation I habitat.
D (Preferred)	Same as Alternative A.
E (Reduced Budget)	Same as Alternative A. Though decreases in planned management activity in this alternative may benefit the grizzly bear, decreases in education, law enforcement, and habitat improvement would outweigh such benefits. Thus the reduced budget alternative overall would reduce the rate of recovery of the grizzly bear.
F (RPA)	Same as Alternative B, except the grizzly bear enhancement prescription (4F) would be applied to about 81,000 acres of Situation I habitat.
Planning Problem #8	Providing adequate quality, quantity, and timing of water yields for the benefit of Forest and nonforest uses.
Related Outputs and Activities (See Tables 2 and 3)	Snowfence Construction Enhanced Summer Runoff Sediment Increase Riparian Fence Construction Increased Erosion Total Water Yield Water Increase Water Meeting Quality Goals Improved Watershed Condition
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein for the attainment and maintenance of Forest conditions that produce water at a level of quality that meets legal standards. Other direction ensures that favorable instream flows are provided, and that water resource data is collected at levels appropriate to meet management

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem	Statements
Summary of Response (Continued)	information needs, define effects of management, and identify baseline values. Such direction is found under: Range Resource Management; Silvicultural Examination and Prescription; Wilderness Area Managment; Wild and Scenic River Management; Dispersed Recreation Management; Riparian Area Management; Water Uses Management; Water Resource Improvement and Maintenance; Minerals Management; and others. Standards and guidelines that would be applied to all alternatives include those found in management prescription 9A (Riparian Area Management). The opportunity to improve the quantity and timing of water yields from the forest does not vary greatly among alternatives. Alternative E is the exception because of the greatly reduced timber program. The water program is subject in all alternatives to proposals for water developments. Such developments could affect the nature and distribution of other outputs and activities on the forest in varying ways by alternative. Implementation of practices and projects to improve water that does not meet quality goals and to improve watershed condition, is regarded as a minimum to be applied in all alternatives. The cost of the water program varies by alternative in response to the nature and total cumulative impact of activities that could potentially affect water quality to the detriment of associated water uses.
Comparative Response by Alternative	
A (Current Direction - No Action)	**With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve. Such implementation under this alternative would be the most costly (along with Alternative F) of all alternatives because of the intensity and quantity of activities that could cumulatively affect water quality, all of which must be mitigated and monitored to meet legal standards (and quality goals commensurate with use of the water).** This alternative would produce the greatest estimated average erosion and sediment. It would produce an estimated average water yield increase 55 percent higher than the current average increase over the planning horizon, and an average sediment increase 10 percent higher.
B (Commodity)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve. Such implementation under this alternative would be nearly as costly as Alternative A because of the intensity and quantity of activities that could cumulatively affect water quality, all of which must be mitigated and monitored to meet legal standards (and quality goals commensurate with use of the water). This alternative would produce slightly less estimated average erosion and sediment then Alternative A. It would produce an estimated average water yield increase 83 percent higher than the current average increase over the planning horizon, and an average sediment increase 3 percent higher.
C (Noncommodity)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

C (Noncommodity) (Continued)	would be expected to improve. Such implementation would be significantly less costly in this alternative compared to current direction due to the limitation on disturbing activities to areas of low risk. Stipulations applied to oil and gas activities to ensure minimum legal water quality standards are met. This alternative would produce an estimated average sediment increase 30 percent lower than the current estimated level. It would produce an estimated average water yield increase 40 percent higher than the current average increase over the planning horizon. In selected areas, timber would be harvested with systems designed to increase water yield. Snowfences would be constructed in other selected areas to improve the timing of water yields for late summer range and irrigation purposes.
D (Preferred)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve. Such implementation would be less costly than under Alternative A, but because commodities would be produced at near current levels this change would not be significant. Factors that would tend to minimize the costs, as compared to current direction, are road closures, less open range, and application of oil and gas stipulations to sensitive areas that would lower the risk of water quality impacts. This alternative would produce an estimated average sediment increase slightly lower than the current estimated level. It would produce an estimated average water yield increase 49 percent higher than the current average increase over the planning horizon.
E (Reduced Budget)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve, generally. Such implementation would be significantly less costly than under current direction because of the reduction in grazing, timber management and new road construction. Reduced funding could, however, affect basic standards of administration, monitoring and maintenance that would tend to increase the risk of lowered water quality in some areas. This alternative would produce the least estimated average erosion and sediment increase. It would produce an estimated average water yield increase 31 percent lower than the current average increase over the planning horizon. Sediment yield would decrease about 68 percent from the current estimated level.
F (RPA)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve. Such implementation under this alternative would be the most costly (along with Alternative A) because of the intensity and quantity of activities that could cumulatively affect water quality, all of which must be mitigated and monitored to meet legal standards (and quality goals commensurate with use of the water). This alternative would produce slightly less estimated average erosion and sediment than Alternative A. It would produce an estimated average water yield increase 44

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

F (RPA) (Continued)	percent higher than the current average increase over the planning horizon. Sediment yield would increase 4 percent above the current estimated level.
Planning Problem #9	Providing appropriate fire management and protection.
Related Outputs and Activities (See Tables 2 and 3)	See PROTECTION in Chapter IV of the DEIS. See also Timber outputs and Wildlife Vegetation Treatment in Tables 2 and 3.
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein that provides appropriate fire management and protection, commensurate with the activities proposed under each alternative. Such direction is found under: Wilderness Area Management; Fire Planning and Suppression; Escaped Fire Suppression; Fuel Treatment; Air Resource Management; and Insect and Disease Management/Suppression. Using this direction, specific and appropriate fire management plans are constructed and displayed in Appendix F of the Plan. This planning problem is responded to exclusively by the General Forest Direction and Forest Direction standards and guidelines that are used to develop Appendix F. Opportunities to exercise protection activities would vary by alternative according to variations in timber management, vegetation treatment and roaded access. Insects and diseases are a part of the natural forest environment and would continue to act as agents of change in the ecological process under all alternatives. Tree mortality would continue to occur across the Forest under all alternatives, especially in areas where access, topography or other resource uses preclude treatment. Surveys and monitoring are essential to identify any buildup of insects or disease that would require initiation of suppression measures. The long range goal of insect and disease management is prevention and suppression through silvicultural treatment of susceptible stands. Silvicultural treatments which remove overmature trees and reduce competition due to overstocking, as well as actual removal of infested trees, tend to increase the vigor of the residual trees and increase resistance to insects and disease on lands suitable for timber production. Broadcast burning is not expected to be a major tool in fuel reduction or management of the Forest's timber resource. Methods of fuel reduction associated with timber harvest and public firewood use are available to reduce fuels buildup. Fuels resulting from timber harvesting and timber stand improvement activities will be treated to meet Regional Acceptable Standards under all alternatives. Vegetation treatment creates more diversity in vegetation and less continuous fuel beds. These are both favorable conditions for the control of wildfires. Vegetation treatment methods, particularly the use of prescribed fire, tend to reduce the wildfire hazard for a few years following treatment. The use of prescribed fire does increase the risk of wildfire, but this is mitigated to an acceptable level through proper planning and execution of the prescribed fires. The amount of area receiving

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements	
Summary of Response (Continued)	vegetation treatment will be greatest under Alternative B. Therefore, the beneficial effects on fire protection will be greatest under this alternative. Prescribed fire will continue to be an important tool in wildlife habitat management with treatment of willow and sagebrush, and occasionally aspen. However, since these vegetation types are relatively fire resistant during most of the year, these treatments will not significantly affect the Forest's fire protection program. Law enforcement activities would increase under all alternatives, except E, as more people visit the Forest for recreation or as other management activities increase. Emphasis would be given to the integration of law enforcement with natural resource management to prevent resource losses and protect Forest visitors.
Comparative Response by Alternative	This planning problem is responded to exclusively by the application of Forest Direction that is applied to all alternatives. There are no significant differences in treatment acres or outputs, Forest-wide. Therefore, no discussion is provided for the individual response of each alternative.
Planning Problem #10	Acquisition of rights-of-way, provision for land adjustments, and special uses.
Related Outputs and Activities	See LANDS in Chapter IV of the DIES.
Summary of Response	Forest Direction (Chapter III of the Plan) is applied to all alternatives. Direction is provided therein for conducting the Lands program which includes rights-of-way, land adjustments and special uses. Such direction is found under: Special Use Management; Rights-of-Way and Land Adjustments; and Property Boundary Location. The lands program, including rights-of-way acquisition, will be carried out according to the legal and practical needs of managing other Forest resources, as determined by the implemented alternative. Under all alternatives, there would be permitted special uses of the Forest. Most of these uses would involve relatively small land areas and would have minimal environmental effects. Some special uses would involve larger land areas and would have substantial environmental effects. Environmental analyses will be conducted when any special use is proposed on the Forest. The emphasis of each alternative would directly influence lands-related actions. As commodity outputs increase, the need for support from the lands program is also likely to increase. The Forest's land aquisition and land exchange program needs have been historically limited because of the relatively small amounts of private lands inside the Forest boundary. It is anticipated this will remain true under any of the alternatives considered. Land purchase, acquisition and/or exchange programs would be relatively consistent for all alternatives except E. All alternatives would have a lands program schedule consistent with the Regional Guide and designed to complete priority purchases and acquisitions by the end of the planning horizon. Alternative E would have no program in land purchase or acquisition.

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	The right-of-way acquisition program would have between three and eight acquisitions for all alternatives except E. The program for each alternative would be commensurate with the road and trail construction/reconstruction needs within each alternative. (The 1980 level is five priority acquisitions annually to meet minimum program requirements.) The surveying, marking and posting of land-lines results in the identification and inventory of occupancy trespass encroachments on National Forest lands. This is a relatively small problem on the Shoshone National Forest. The land-line surveying program is expected to remain constant in each of the alternatives except E. Alternatives would not affect utility corridors or water developments. Existing and future considerations of utility corridors come from industry demands for electric transmission lines, communications lines and microwave sites. The demand for energy production would control the continued need for pipelines for the transmission of coal, oil and gas regardless of the selected alternative. The expansion of existing utility corridors and the addition of others would be necessary to accommodate the demand for utilities in all areas of the Forest. Construction of new transportation and utility facilities would be needed to meet increasing demands and to accommodate future needs not anticipated at the time of plan preparation.
Comparative Response by Alternative	This planning problem is responded to exclusively by Forest Direction that is applied to all alternatives. Therefore, no discussion is provided for the individual response of each alternative.
Planning Problem #11	Providing opportunities for mineral exploration, development and extraction at levels compatible with other resource values and uses.
Related Outputs and Activities (See Tables 2 and 3)	Nonreserved Areas See MINERALS in Chapter IV of the DEIS.
Summary of Response	Forest Direction (Chapter III of the Plan) is applied to all alternatives. General direction is provided therein for conducting minerals programs to include the objectives and values of other resource programs. Such direction is found under: Wild and Scenic River Management; Visual Resource Management; Wilderness Area Management; Riparian Area Management; Water Resouce Improvement and Maintenance; Minerals Management General; Mining Law Compliance and Admininstration; Minerals Management (Oil, Gas and Geothermal); Minerals Management (Coal, Leasable Uranium and Nonenergy Common Minerals Materials); and Soil Resource Management. Locatable, leaseable and saleable minerals are constrained on a quantitative (i.e., acreage) basis to the same extent in each alternative. The fact that every alternative displays the same acreage (935,000) as available for oil and gas leasing does not mean that the management of this class of minerals activity would be the same in all alternatives. As described in Chapter III of the proposed Forest Plan, every lease application on Forest land is reported to the Bureau of Land Management with

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	attached stipulations tailored to be responsive to the management direction for the analysis area involved. This selection of lease stipulations is very much a site-specific activity, requiring that the stipulations be tailored to actual conditions on the specific lease tract being applied for. The specific lease stipulations available are presented in Chapter III and Appendix E of the Forest Plan. The stipulations selected, and the details specified in these stipulations, will be responsive to the management direction unique to some alternatives. Stipulations would be assigned to leases by using the procedure detailed in Plan Appendix K. All alternatives include stipulations for protecting surface resources at the minimum acceptable level. Alternatives C and D would provide stipulations and more stringent recommended operating standards that protect visual resources at the prevailing visual quality level for selected areas and that reduce the risk of not meeting quality standards for other resources. Inside of wilderness, any mineral activity would have to comply with the provisions of the Wilderness Act of 1964. All alternatives recommend lease denial in grizzly bear Situation I habitat; outside of wilderness, a one-half mile zone along the interior boundary of Situation 1 areas may be leased on a case-by-case basis with the no-surface-occupancy stipulation.
Comparative Response by Alternative	
A (Current Direction - No Action)	Relatively unrestricted opportunities for oil and gas activities are provided. Oil and gas activities would be conducted with stipulations that insure minimum acceptable standards are met. Areas of high hazard to the soil/water complex (about 534,000 acres) will receive a no-surface-occupancy stipulation on the Forest Service's lease application report to the Bureau of Land Management.
B (Commodity)	Same as Alternative A.
C (Noncommodity)	Oil and gas activities Forest-wide would be conducted with stipulations and more stringent recommended operating standards that are intended to maintain surface resource values at a high level (level above minimally acceptable), which is to reduce the risk of not meeting minimum standards and objectives. Areas of high hazard to the soil/water complex (about 534,000 acres) will receive a no-surface-occupancy stipulation on the Forest Service's lease application report to the Bureau of Land Management. All lease reports will include the package of stipulations and recommended operating standards as detailed in Plan Appendix K. Such measures are necessary to properly emphasize the noncommodity values stressed in this alternative. Oil and gas operations, developments, and facilities would conform to the existing visual quality objective of an area. Oil and gas exploration would be required to depend very heavily upon airlift or nonmotorized access to operations sites to minimize impacts on recreation, watershed and wildlife.
D (Preferred)	Oil and gas activities would be conducted in sensitive or special areas with stipulations and stringent recommended operating

TABLE 1 (Continued)

Comparison of Alternative Responses to Planning Problem Statements	
D (Preferred) (Continued)	which is to reduce the risk or not meeting minimum standards and objectives. Selected areas that possess important visual, recreation, wildlife or watershed values would be leased with stipulations and more stringent operating standards (Appendix K of the Plan) that maintain or protect those values. In areas where other commodity values are emphasized, a standard or less restrictive set of stipulations and standards would be applied to leases. Areas of high hazard to the soil/water complex (about 534,000 acres) will receive a no-surface-occupancy stipulation on the Forest Service's lease application report to the Bureau of Land Management.
E (Reduced Budget)	Same as Alternative A. A reduced budget would decrease the effectiveness or quality of administration and monitoring of minerals activities and related facilities.
F (RPA)	Same as Alternative A.

TABLE 2

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for Planning Period 1)

Item	Unit of Measure[1]	Alternatives A Current	 B Commodity Emphasis	 C NonCommodity Emphasis	 D Preferred	 E Reduced Budget	 F RPA
VEGETATION							
Sage Management - Cattle		.... see RANGE					
Sage Management - Wildlife		.... see WILDLIFE & FISH					
Aspen Management		.... see WILDLIFE & FISH					
Willow Management		.... see WILDLIFE & FISH					
Noxious Weed Treatment		.... see RANGE					
Timber Harvest		.... see TIMBER					
RECREATION							
Developed Public	MRVD	271.	292.	262.	285.	238.	275.
Facility Construction/Reconstruction	M$	147.	169.	108.	153.	86.0	148.
Developed Private	MRVD	151.	151.	151.	151.	148.	151.
Downhill Skiing	MRVD	5.40	5.40	5.40	5.40	5.10	5.40
Dispersed Nonmotorized	MRVD	61.2	81.2	94.5	80.5	51.5	77.3
Dispersed Motorized	MRVD	996.	1,110	1,139.	1,151.	1,056	1,092.
Dispersed Facility Construction/Reconstruction	M$	14.9	12.0	13.7	14.0	7.00	13.0
Wildlife and Fish Use	MWFUD	289.	297.	306.	288.	235.	296.
Primitive Nonwilderness	MACRES	11.8	0.00	5.27	15.3	20.0	11.8
Semiprimitive Nonwilderness Nonmotorized	MACRES	383.	524.	585.	459.	554.	466.
Semiprimitive Motorized	MACRES	352.	231.	153.	301.	229.	275.
Roaded Natural	MACRES	278.	285.	250.	266.	201.	298.
Rural	MACRES	22.9	10.8	10.8	10.8	21.5	10.8
Open to Snowmobiling	MACRES	546.	474.	434.	516.	248.	452.
Restricted Snowmobiling	MACRES	214.	86.0	110.	136.	54.0	116.
Closed to Snowmobiling	MACRES	1,674.	1,873.	1,889.	1,781.	2,110.	1,865.
Restrictions on ORV's	MACRES	364.	218.	225.	261.	130.	208.
Closed to ORV's	MACRES	2,069.	2,216.	2,208	2,172.	2,303.	2,225.
WILDERNESS							
Wilderness Use	MRVD	206.	200.	230.	196.	183.	220.
Pristine Wilderness	MACRES	146.	139.	135.	159.	139.	151.
Primitive Wilderness	MACRES	735.	769.	710.	740.	565.	658.
Semiprimitive Wilderness	MACRES	501.	472.	535.	482.	677.	572.

TABLE 2 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for Planning Period 1)

Item	Unit of Measure[1]	Alternatives A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
VISUAL MANAGEMENT							
Visuals Rehabilitation and Enhancement	MACRES	2.05	2.05	2.05	2.05	1.2	2.06
Preservation Visual Quality	MACRES	1,386.	1,620.	1,654.	1,582.	1,478.	1,670.
Retention Visual Quality	MACRES	756.	530.	491.	566.	736.	480.
Partial Retention Visual Quality	MACRES	208.	201.	200.	203.	137.	202.
Modification Visual Quality	MACRES	66.1	64.3	70.7	65.6	71.3	65.3
Maxmimum Modification Visual Quality	MACRES	16.8	16.8	16.8	16.8	10.2	16.8
WILDLIFE AND FISH							
Sage Management	ACRES	264.	337.	323.	390.	190.	325.
Aspen Management	ACRES	139.	167.	189.	145.	119.	156.
Willow Management	ACRES	17.5	17.5	6.00	17.5	0.00	17.5
Structural Improvements	MILES	0.30	2.00	0.70	0.50	0.30	2.00
Aquatic Habitat Improvement	M$	0.20	0.20	0.20	0.20	0.20	0.20
Wildlife Forage	MCAUMS	42.1	47.3	71.9	42.9	98.5	44.6
Crucial Preferred Winter Range							
Deer & Elk	MACRES	40.7	40.7	40.7	40.7	40.7	40.7
Moose	MACRES	10.7	10.7	10.7	10.7	10.7	10.77
Bighorn Sheep	MACRES	42.6	42.6	42.6	42.6	42.6	42.6
Mountain Goat	MACRES	0.924	0.924	0.924	0.924	0.924	0.924
Grizzly Bear Situation I	MACRES	412.0	412.0	412.0	412.0	412.0	412.0
Grizzly Bear Situation II	MACRES	819.6	819.6	819.6	819.6	819.6	819.6
Grizzly Bear Situation III	MACRES	17.4	17.4	17.4	17.4	17.4	17.4
Bald Eagle and Peregrine Falcon Habitat	MACRES	29.6	29.6	29.6	29.6	29.6	29.6
RANGE							
Cattle Forage	MCAUMS	76.6	78.6	55.3	78.0	35.3	81.6
Sheep Forage	MSAUMS	35.1	37.9	31.5	25.4	1.70	33.1
Sage Management	ACRES	305.	232.	153.	278.	42.0	218.
Noxious Weed Treatment	ACRES	173.	169.	149.	172.	95.	185.
Range Improvements - Fencing	MILES	3.20	3.40	2.90	3.20	1.00	3.00
Range Improvements - Other	# STRCTRS	5.1	4.70	3.60	5.10	2.40	4.00
Range Suitable and Open	MACRES	272.	256.	204.	260.	80.2	261.

TABLE 2 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for Planning Period 1)

		Alternatives					
Item	Unit of Measure[1]	A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
TIMBER							
Suitable Acres	MACRES	89.0	106.	71.0	85.4	24.7	82.9
Planting (Reforestation)	ACRES	11.0	139.	0.00	11.0	0.00	0.00
Clearcut Harvest	ACRES	274.	471.	144.	258.	0.00	247.
Seedcut	ACRES	455.	387.	350.	444.	38.0	407.
Overstory Removal	ACRES	375.	399.	375.	367.	282.	395.
Selection Cut[2]	ACRES	966.	1,014	496.	920.	105.	911.
Commercial Thinning	ACRES	246.	347.	298.	285.	445.	235.
Timber Stand Improvement	ACRES	207.	212.	144.	190.	0.00	197.
Sawtimber Harvested	MMBF	10.9	11.9	7.58	10.5	2.68	10.3
Poletimber Harvested	MMBF	0.664	0.98	.0.436	0.680	0.316	0.57
Fuelwood	MMBF	1.27	1.42	.0.881	1.23	0.330	1.19
WATER							
Snowfence Construction	MILES	0.00	0.00	0.20	0.00	0.00	0.00
Total Water Yield	MAF	3,612.	3,612.	3,612.	3,612.	3,611.	3,612.
Enhanced Summer Runoff	MAF	0.00	0.00	0.00	0.00	0.00	0.00
Water Increase	MAF	2.65	2.14	2.63	2.65	1.37	2.65
Sediment Increase	MTONS	24.9	25.3	17.3	24.1	8.00	25.5
Water Meeting Quality Goals	MAF	3,316.	3,316.	3,316.	3,316.	3,316.	3,316.
Riparian Fence Construction	MILES	3.90	3.70	3.10	3.80	1.70	4.3
MINERALS							
Nonreserved Areas	MACRES	935.	935.	935.	935.	935.	935.
SOILS							
Improved Watershed Condition	ACRES	0.00	0.00	0.00	0.00	0.00	0.00
Erosion Increase	MTONS	385.	338.	177.	322.	76.4	330.

TABLE 2 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for Planning Period 1)

Item	Unit of Measure[1]	Alternatives A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
FACILITIES							
Road Maintenance - Total Miles	MILES	1,477.	1,463.	1,452.	1,467.	960.	1,456.
Road Construction/Reconstruction	MILES	15.0	13.0	14.0	13.0	2.0	11.0
Roads Obliterated	MILES	4.80	4.80	4.80	5.20	2.5	4.8
Roads Closed	MILES	134.	225.	301.	99.0	114.	144.
Roads Controlled	MILES	415.	629.	547.	815.	345.	525.
Roads Open	MILES	941.	607.	608.	578.	500.	683.
FA&O Construction/Reconstruction	M$	8.90	8.90	8.20	8.90	6.1	8.9
Trail Construction/Reconstruction	MILES	3.00	3.00	3.00	3.00	0.70	3.00
Trail Maintenance	MILES	1294.	1297.	1300.	1300.	559.	1,267.

1/ Units of Measure

MRVD = thousands recreation visitor days
M$ = thousands of dollars
MWFUD = thousands of wildlife user days plus thousands of fish user days
MACRES = thousands of acres
MCAUMS = thousands of cattle animal unit months
MSAUMS = thousands of sheep animal unit months
MMBF = millions of board feet
MAF = thousands of acre-feet
MTONS = thousands of tons

2/ Selection cutting is on a twenty year rotation

TABLE 3

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for 1984-2035)

Item	Unit of Measure[1]	Alternatives A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
VEGETATION							
Sage Management - Cattle			....	see RANGE	....		
Sage Management - Wildlife			....	see WILDLIFE & FISH	....		
Aspen Management			....	see WILDLIFE & FISH	....		
Willow Management			....	see WILDLIFE & FISH	....		
Noxious Weed Treatment			....	see RANGE	....		
Timber Harvest			....	see TIMBER	....		
RECREATION							
Developed Public	MRVD	298.	312.	283.	309.	255.	296.
Facility Construction and Reconstruction	M$	160.	179.	161.	196.	133.	163.
Developed Private	MRVD	174.	174.	174.	174.	170.	174.
Downhill Skiing	MRVD	6.23	6.23	6.23	6.23	5.90	6.23
Dispersed Nonmotorized	MRVD	99.2	148.	229.	139.	81.0	136.
Dispersed Motorized	MRVD	1,294.	1,406.	1,471.	1,459.	1,350.	1,381.
Dispersed Facility Construction and Reconstruction	M$	4.80	3.94	4.92	4.20	3.00	5.00
Wildlife and Fish Use	MWFUD	289.	297.	306.	287.	235.	296.
Primitive Nonwilderness	MACRES	11.8	0.00	5.27	15.3	20.0	11.8
Semiprimitive Nonwilderness Nonmotorized	MACRES	381.	521.	585.	457.	556.	468.
Semiprimitive Motorized	MACRES	354.	253.	167.	319.	231.	291.
Roaded Natural	MACRES	278.	260.	284.	250.	197.	272.
Rural	MACRES	22.9	10.8	10.8	10.8	21.5	10.8
Open to Snowmobiling	MACRES	546.	474.	446.	517.	242.	452.
Restricted Snowmobiling	MACRES	214.	86.0	110.	136.	54.0	116.
Closed to Snowmobiling	MACRES	1,674.	1,873.	1,877.	1,780.	2,137.	1,865.
Restrictions on ORV's	MACRES	364.	218.	225.	261.	130.	208.
Closed to ORV's	MACRES	2,069.	2,216.	2,208.	2,172.	2,303.	2,225.
WILDERNESS							
Wilderness Use	MRVD	396.	378.	425.	337.	265.	405.
Pristine Wilderness	MACRES	146.	139.	135.	159.	139.	151.
Primitive Wilderness	MACRES	735.	769.	710.	740.	565.	658.
Semiprimitive Wilderness	MACRES	501.	472.	535.	482.	677.	572.

TABLE 3 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for 1984-2035)

Item	Unit of Measure[1]	Alternatives A Current	 B Commodity Emphasis	 C NonCommodity Emphasis	 D Preferred	 E Reduced Budget	 F RPA
VISUAL MANAGEMENT							
Visual Rehabilitation and Enhancement	MACRES	1.19	1.19	1.13	1.13	0.655	1.19
Preservation Visual Quality	MACRES	1,422.	1,610.	1,654.	1,589.	1,493.	1,670.
Retention Visual Quality	MACRES	732.	549.	508.	578.	787.	514.
Partial Retention Visual Quality	MACRES	227.	220.	209.	216.	123.	208.
Modification Visual Quality	MACRES	47.5	48.5	56.2	44.7	27.0	35.1
Maxmimum Modification Visual Quality	MACRES	4.55	4.55	4.55	4.55	3.23	4.55
WILDLIFE AND FISH							
Sage Management	ACRES	258.	340.	351.	348.	225.	319.
Aspen Management	ACRES	90.0	98.8	132.	90.2	52.0	87.4
Willow Management	ACRES	28.5	28.2	9.00	28.5	0	28.2
Structural Improvements	MILES	0.12	0.20	0.36	0.16	0.08	0.40
Aquatic Habitat Improvement	M$	0.10	0.10	0.10	0.10	0.10	0.10
Wildlife Forage	MCAUMS	49.7	55.4	84.3	50.4	120.	52.2
Crucial Preferred Winter Range							
Deer & Elk	MACRES	40.7	40.7	40.7	40.7	40.7	40.7
Moose	MACRES	10.7	10.7	10.7	10.7	10.7	10.7
Bighorn Sheep	MACRES	42.6	42.6	42.6	42.6	42.6	42.6
Mountain Goat	MACRES	0.924	0.924	0.924	0.924	0.924	0.924
Grizzly Bear Situation I	MACRES	412.0	412.0	412.0	412.0	412.0	412.0
Grizzly Bear Situation II	MACRES	819.6	819.6	819.6	819.6	819.6	819.6
Grizzly Bear Situation III	MACRES	17.4	17.4	17.4	17.4	17.4	17.4
Bald Eagle and Peregrine Falcon Habitat	MACRES	29.6	29.6	29.6	29.6	29.6	29.6
RANGE							
Cattle Forage	MCAUMS	94.7	96.1	69.1	96.4	41.5	99.8.
Sheep Forage	MSAUMS	40.7	44.7	36.0	30.1	1.90	40.0
Sage Management	ACRES	307.	228.	141.	274.	33.0	218.
Noxious Weed Treatment	ACRES	71.	69.	65.	71.	36.	70.
Range Improvements - Fencing	MILES	0.90	0.90	0.760	0.80	0.20	0.80
Range Improvements - Other	# STRCTRS	1.32	1.24	1.00	1.20	0.40	1.32
Range Suitable and Open	MACRES	272.	256.	204.	260.	80.2	261.

TABLE 3 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for 1984-2035)

Item	Unit of Measure[1]	Alternatives A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
TIMBER							
Suitable Acres	MACRES	89.0	106.	71.0	85.4	24.7	82.9
Planting (Reforestation)	ACRES	9.22	166.	1.00	9.00	2.30	3.60
Clearcut Harvest	ACRES	192.	444.	164.	187.	88.4	180.
Seedcut	ACRES	493.	470.	401.	469.	70.0	445.
Overstory Removal	ACRES	492.	423.	442.	479.	111.	467.
Selection Cut[2]	ACRES	1,213.	1,276.	736.	1,160.	170.	1,155.
Commercial Thinning	ACRES	133.	137.	132.	141.	208.	129.
Timber Stand Improvement	ACRES	150.	196.	131	146.	80.0	142.
Sawtimber Harvested	MMBF	11.2	12.1	8.63	10.7	2.84	10.4
Poletimber Harvested	MMBF	0.554	0.76	0.375	0.529	0.159	0.54
Fuelwood	MMBF	1.34	1.42	0.991	1.24	0.330	1.21
WATER							
Snowfence Construction	MILES	0.00	0.00	0.26	0.00	0.00	0.00
Total Water Yield	MAF	3,614.	3,614.	3,613.	3,613.	3,611.	3,614.
Enhanced Summer Runoff	MAF	0.00	0.00	0.563	0.00	0.00	0.00
Water Increase	MAF	4.14	4.91	3.77	3.99	1.85	3.87
Sediment Increase	MTONS	32.8	32.1	21.2	28.7	8.00	30.1
Water Meeting Quality Goals	MAF	3,450.	3,450.	3,450.	3,450.	3,450.	3,450.
Riparian Fence Construction	MILES	1.86	1.74	1.66	2.00	0.98	1.94
MINERALS							
Nonreserved Areas	MACRES	935.	935.	935.	935.	935.	935.
SOILS							
Improved Watershed Condition	ACRES	4,020	4,020	4,020	4,020	4,020	4,020
Erosion Increase	MTONS	385.	338.	177.	322.	76.4	330.

TABLE 3 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for 1984-2035)

Item	Unit of Measure[1]	Alternatives A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
FACILITIES							
Road Maintenance - Total Miles	MILES	1,614.	1,552.	1,563.	1,568.	1,040	1,554.
Road Construction and Reconstruction	MILES	15.8	14.6	11.0	14.0	3.14	12.0
Roads Obliterated	MILES	0.20	1.78	1.78	2.00	0.96	1.78
Roads Closed	MILES	102.	261.	325.	102.	120.	142.
Roads Controlled	MILES	873.	655.	585.	853.	376.	633.
Roads Open	MILES	660.	637.	652.	640.	465.	768.
FA&O Construction and Reconstruction	M$	8.86	8.86	8.44	10.0	7.18	8.86
Trail Construction/Reconstruction	MILES	3.00	2.80	2.80	3.00	1.36	3.00
Trail Maintenance	MILES	1,363.	1,330.	1,362.	1,364.	588.	1,330.

1/ Units of Measure

MRVD = thousand recreation visitor days
M$ = thousands of dollars
MWFUD = thousands of wildlife user days plus thousands of fish user days
MCAUMS = thousands of cattle animal unit months
MSAUMS = thousands of sheep animal unit months
MMBF = millions of board feet
MAF = thousands of acre-feet
MTONS = thousands of tons

2/ Selection cutting is on a twenty year rotation

AFFECTED ENVIRONMENT

Physical, Biological, Social and Economic Setting

The Shoshone National Forest is in the northern Rocky Mountains. These mountains consist of north to south trending ranges and include the Absaroka and Wind River Ranges, along and to the east of the Continental Divide. Most of the Forest is within the upper Missouri River Basin, subdivided by the Wind, Big Horn and Clark's Fork River basins. The southern tip of the Forest is in the Sweetwater drainage which flows into the Platte River system.

Variation in physical and biological characteristics of the Forest is a product of a wide range of geologic types, topographic features, and microclimates. Vegetation patterns, landforms, soil characteristics and wildlife habitat distribution can vary tremendously within short distances.

Wildlife on the Shoshone National Forest is abundant in terms of populations and diversity of species. There are a total of 72 mammal, 230 bird, 9 reptile, 7 amphibian, and 19 fish species recorded for the Forest. Forty-eight species of birds and mammals are considered as "game animals". Essential habitat for grizzly bears occurs in significant amounts (412,000 acres) on the Forest in association with adjacent portions of the greater Yellowstone area. Habitat for other T&E species is present on the Forest.

There are approximately 1,000 miles of perennial streams and about 7,900 acres of lakes and reservoirs on the Forest which provide good fish habitat.

Vegetation within the Forest is classified into five broad communities: alpine; coniferous forest; montane meadow-parkland; sagebrush-grassland; and riparian.

The Forest has been divided into two Economic Impact Areas. Selection of these areas was based on how management of the Forest affects economic systems. The north half of the Forest directly influences Park and Hot Springs Counties, and the south half of the Forest directly influences Fremont, Teton and Sublette Counties. Major economic impacts occur in Park and Fremont Counties. Because of this, these two counties were selected to represent the relative impacts of alternatives for the Northern and Southern Economic Impact Areas respectively.

In a similar manner, two social impact areas were defined. The first, Park County, is directly affected by management of the north half of the Forest and combines the Beartooth and Bighorn Basin West areas. The second, Fremont County, is directly affected by management of the south half of the Forest and combines the Wind River, Wind River Indian Reservation and Lander/Riverton areas. These social impact areas represent impacts on all five counties and correspond to the economic impact areas so that social and economic impact analysis can be linked.

Resource Elements and Support Activities

The Forest may be described in terms of its resource elements and support activities. The capacity to provide outputs, goods and services is directly related to management of these resources and support activities. The following briefly describes the current condition of the resources and support activities to provide a basis for evaluating the effects of the alternatives over the 50-year planning horizon.

Recreation

Each year the Shoshone National Forest provides about two million recreation visitor days (RVDs) of outdoor recreation enjoyment to the public. This use occurs in wilderness, dispersed areas and developed sites.

Dispersed recreation occurs on lands outside of developed sites. Dispersed recreation opportunities and use within Wilderness is discussed in the section under Wilderness. Dispersed recreation outside wilderness traditionally receive about 52 percent of the total Forest recreation use. Visitors may travel on horseback, foot, skis, snowshoes, snowmobiles, motorcycles, autos, four-wheel or all terrain vehicles. They engage in recreation activities such as backpacking, hiking, tent camping, fishing, hunting, mountain climbing, photography, auto-touring, four-wheeling, firewood gathering, Christmas tree cutting, or just enjoying the scenery unique to the Shoshone National Forest.

Developed recreation is activity that occurs in areas built especially for support of outdoor recreation opportunities, such as campgrounds, picnic areas, downhill ski areas, trailheads, resorts, lodges, and interpretive service centers or sites. On the Shoshone National Forest, developed recreation use makes up about 34 percent of the annual total of recreation visitor days. Recreation use of wilderness makes up the remaining fourteen percent of the annual use on the Forest.

There are seventeen developed recreation sites within the Forest boundary owned or administered by private individuals. The sites include guest ranches and lodges, and have an estimated capacity for 889 PAOTs. In addition to these sites, there are three winter sport sites with a total capacity of 480 PAOTs.

A major factor influencing the use of Forest resources for dispersed recreation is the Forest Travel Management Plan. Motorized recreation use on the Forest is currently managed according to the Shoshone National Forest Travel Map. Presently, 45 percent of the Forest is open with restrictions on motorized use and 55 percent is closed (wilderness, ski areas, wildlife and other closures).

Cultural Resources

The Shoshone National Forest occupies a part of western Wyoming that is rich in prehistoric and contemporary history. Using primary and secondary source material, there is verifiable evidence that prehistoric human occupation of the area dates from the Paleo-Indian Period some 12,000 years ago to the Protohistoric period which saw the introduction of the horse and, later in time, European trade goods.

Settlement of the area by whites occurred during the period of 1867-1890 and was oriented around stock raising and related agriculture. The creation of Yellowstone National Park in 1872 and the establishment of the Yellowstone Timberland Reserve and the Teton Forest Reserve during 1891 to 1904, which led to the eventual establishment of the National Forests, have had a significant effect on the course of the contemporary history of the area and its natural resource based economy. The Forest's historic cultural resources represent a variety of themes associated with mining, stock raising, logging, wildlife use and managment and some of the earliest use of National Forests for recreation.

Protection efforts to date have been geared toward insuring that archaeological resources are not damaged through other resource activities. A majority of known sites are protected with anonymity and unscheduled surveillance. The Wapiti Ranger Station is being protected by occupancy, and some artifacts of the Dead Indian Site have been curated and are on display at the Supervisor's Office. Artifacts from Mummy Cave have also been curated and are on display at the Buffalo Bill Historical Center. The site itself is protected by closure and fencing. Union Pass has interpretation facilities for public enjoyment and the Brook's Lake Lodge is currently being renovated by the private sector.

The Forest Service is required to complete cultural resource inventories by 1990. As ground disturbing activites occur in the future, additional site and area specific inventories will be undertaken. Present detailed knowledge of the extent and significance of prehistoric sites on the Forest is poor. It is highly important that ground disturbing activities include careful and timely cultural resource reviews prior to the actual activity and that any site discoveries be promptly and accurately reported, evaluated and recorded; and that significant sites are protected or curated.

Visual Resources

On a majority of the Forest, the forces of nature have prevailed and only ecological changes have occurred. Some Forest landscapes have changed because of timber harvesting, range improvements, wildlife habitat improvements, recreation developments, road and trail construction, and mineral activities. Such visual impacts occur most frequently on elevations below 10,000 feet. These landscapes are best suited for facilities and activities such as transportation and utility corridors, timber sales, mining, gravel pits, range and wildlife improvements, and recreation facilities. These activities will most likely occur on the same landscapes in the future.

The Visual Management System has been implemented on the Forest from Forest planning to site-specific projects. Landscape maintenance or enhancement has occurred along some major travel corridors through vegetation management projects. Currently, the amount of landscape management varies by project, area and visual sensitivity. Demands for quality landscapes also include a healthy appearing Forest. To control insect and disease problems associated with unmanaged forests, a demand for vegetation management exists.

Wilderness

The Shoshone National Forest has a vast, diverse, and highly scenic wilderness resource. Wilderness has been recognized as a vital part of the Forest's natural resource base since 1929 when the Beartooth, North and South Absaroka and the Glacier and Popo Agie Primitive Areas were administratively designated under the Secretary of Agriculture Regulation L-20.

There are currently five wildernesses and one wilderness study area on the Forest. Passage of the Wyoming Wilderness Act added 142,238 acres to existing wilderness for a total of 1,379,048 acres (56.7 percent of the Forest net acreage). An additional 14,700 acres was established as the High Lakes Wilderness Study Area. The Dunoir Special Area (28,987 acres) was not classified as wilderness, but the provisions of P.L. 92-476 still apply until resolution by Congress (provides for management of the area to preserve wilderness character).

Recreation use of wilderness on the Forest is well below the national average. Wilderness recreation use is about 14 percent of the Forest's annual total use. Users travel on horseback or on foot, skis or snowshoes, and engage in recreation activities such as backpacking, hiking, fishing, hunting, mountain climbing, photography, nature study and other activities dependent on settings provided by wilderness. Different types of use are found on the north half of the Forest, in comparison to the south half. Use on the Washakie and North Absaroka Wildernesses traditionally involves a high amount of horse and outfitter use. On the south half (Fitzpatrick and Popo Agie Wildernesses), use involves mostly backpacking and hiking use.

Current management philosophy on the Forest is to provide the wilderness user a management setting that minimizes the amount of restrictions and controls. Restrictions are limited to common wilderness regulations except in grizzly bear habitat. In grizzly habitat, occurring primarily on the North half of the Forest, restrictions will affect the methods of camping and outfitting, as well as the areas available for campsites. Area closures could also be implemented to protect grizzly habitat.

Fish and Wildlife

The Forest provides a wide variety of suitable habitats for many species of mammals, birds, reptiles, amphibians, and fish, and is perhaps unequaled in the lower 48 States in terms of big game populations and diversity.

The Forest has expanded from a habitat management policy of protecting habitats through coordination with other Forest resource management activities and mitigation measures, to one which also includes increased direct investment in habitat improvement projects. Prime examples of this shift are cooperative habitat improvements for bighorn sheep on Whiskey Mountain (such as water development, seeding, fertilization, snow fencing and vegetation management by prescribed burning); aspen cutting to maintain this habitat component for wildlife; sagebrush treatment to increase forage for elk, bighorn sheep and deer; willow treatment and protection for moose and riparian dependent species and protection fencing of ponds to enhance waterfowl production.

The most important big game species from a socio-economic standpoint are elk, deer and bighorn sheep. In 1981, these three species provided 48.9, 7.6 and 2.7 thousands of recreation visitor days (MRVD's), respectively, of big game hunting. In addition, bighorn sheep viewing (non-consumptive use) on Whiskey Mountain included 60,000 recreation visitor days of use.

There are approximately 1,000 miles of perennial streams and 7,900 acres of lakes and reservoirs on the Forest which provide good fish habitat. There are approximately 500 lakes on the Forest with the majority of these being on the Beartooth Plateau, Fitzpatrick Wilderness and Popo Agie Wilderness. Many of these lakes are barren and have not been stocked. Important fish species include Yellowstone and Snake River cutthroat, rainbow, German brown and golden trout, mackinaw and Arctic Grayling.

Threatened and endangered species of concern to the Forest include the bald eagle, peregrine falcon, gray wolf, black-footed ferret and the grizzly bear. The status of the grizzly bear is receiving widespread National attention and the Forest is a part of the Yellowstone area which represents a realistic opportunity for maintaining a viable grizzly bear population. There are no known threatened or endangered plants on the Forest.

Range

Approximately 17 percent, or 490,000 acres, of the Shoshone National Forest is classified as capable and suitable livestock rangelands. The suitable range is generally in fair or better ecological condition, with isolated cases of deteriorated range due to excessive grazing by livestock or wildlife.

Some ranchers with Forest grazing permits are economically dependent on these permits for the continuation of their operations. Ranching operations in general are moving from small family operations to large company operations. Sheep grazing on the Forest is decreasing, with many of the allotments in nonuse or vacancy status. There is an increase in requests to convert sheep allotments to cattle allotments.

Most grazing occurs under deferred rotations or extensive (open season-long) management systems. The topography of the Forest is such that intensive grazing systems (rest-rotation) cannot be developed. Most of the allotments have severe elevation ranges, with the uppermost areas not ready for grazing until early fall. Therefore, grazing these upper pastures first on a rotation system is impractical. Deferred rotation and modified rest-rotation systems have been implemented on some allotments.

Timber

Through analysis, 144,682 acres, or 5.9 percent of the total Forest landbase, has been designated as tentatively suitable for timber production. This means that only about 0.4 percent of the Forest would be affected by timber management activities in any ten year time span.

Timber management, even on this small proportion of the total Forest, has significant effects. It provides a source of materials for the forest products industries, posts and poles for fence construction, and an abundant source of firewood for local residents. Beyond these direct benefits, forest cover can be manipulated as part of a healthy ecosystem to produce multiple-use benefits such as visual quality, wildlife forage and water yield in selected areas.

Demand for sawtimber from local mills appears stable. Poor markets nationally have led to some short-term drops in sales and cuts. However, projections for the next ten years show a stable to slightly increasing trend. There has been an increase in demand for posts, poles and firewood over the last five years. This trend is expected to continue in the foreseeable future. Beyond demand from sawmills, current insect and disease problems, needs for improved access, and wildlife and recreation demands will necessitate increased harvests over the next five decades.

Water

Watersheds on the Forest are among the most important sources of surface water in the Big Horn, Wind and Clark's Fork River basins in Wyoming. Primary uses of water off the Forest are related to agricultural production. Three municipalities use water for domestic supply immediately off the Forest. Primary uses of water on the Forest are for administrative, stock and recreation related purposes. Water is used instream for maintenance of favorable flow conditions, aesthetics and fisheries. Demands for water supplies are related to storage facility or diversion construction to make plentiful supplies more available during the late summer. There are between twenty and thirty sites on the Forest with potential as useable water storage facilities.

Groundwater is generally not available on the Forest. Some geologic formations within the periphery of the Forest contribute to recharge of aquifers that are accessible on the basin floor.

Water quality is generally regarded as good. Very little data is available to define water quality of streams and rivers on the Forest. Data is not available to define the effects of past management activities. The Forest Watershed Problem Assessment indicates that water quality goals or standards are not being met in some areas. The need to implement a water monitoring plan is thereby demonstrated.

Wetlands and Floodplains

It is estimated that about 51,000 acres of wetland and riparian habitat occur in the Shoshone National Forest. Of the total, about 10,000 acres are wetland ecosystems and the remainder are riparian ecosystems. Included in the riparian ecosystems are about 28,000 acres of floodplain. In addition, the Forest has approximately 11,700 surface acres of lakes, many of which are small (less than ten surface acres) and at high altitude.

The function and character of these areas are critical to other resource uses and values. Water quality, vegetation diversity, soil stability, hydrologic utility, and wildlife and fish are directly dependent upon quality wetlands and undisturbed floodplains. These physical characteristics contribute to the attractiveness of wetlands for recreation, livestock grazing, timber harvest, and facilities development.

Minerals

Exploration for base and precious metals has taken place in the Forest periodically since the late 1800's. Upper Sunlight Creek, Needle Creek, Kirwin and South Pass are mining areas where the majority of mining activity has occurred. Ores containing various minerals occur on the Forest in two general geologic environments: volcanic intrusive complexes and sedimentary deposits. Approximately one-quarter of the Forest is estimated to have high to moderate potential for locatable minerals.

There are approximately 400 oil and gas leases on the Forest. There are also about 140 pending lease applications. The Forest receives between 50 and 100 lease applications annually. Exploration for and development of oil and natural gas resources is expected to increase in the future. The level of activity will be based upon price of the product versus cost. A major effect of these activities on the Forest would come from support facilities such as roads, pipelines and electric transmission lines.

The Forest Service objective is to manage mineral related activities in a timely manner, and to integrate the exploration, development and production of mineral and energy resources with the use, conservation and protection of other resources.

Human and Community Development

The Shoshone National Forest is committed to the nationwide program emphasizing human and community development. This program includes activities that provide work and learning experiences for various segments of our population and communities; i.e. unemployed youth, senior citizens' employment opportunities, adult training, and college level credit work experience.

The Forest has been actively engaged in a variety of manpower and human resource development programs for a number of years. Opportunities for development are limited because of the Forest's location relative to large population centers and institutions of higher learning, particularly under current funding levels.

Lands

The Forest presently has 351 special use permits including 19 for resorts, lodges and ski areas. In addition, the Forest issues approximately 110 permits for outfitter/guide base camps annually. Special use permit issuance has been increasing recently at the rate of five percent per year.

There are an estimated 1,250 miles of needed property boundary location on the Shoshone National Forest. The need to locate and post boundaries will increase with increased timber management activities, increased recreation use, more intensive grazing systems, and as private lands are developed.

Because of the variety of land ownership patterns adjacent to the Forest and lack of rights-of-way (ROW's), access via roads and trails to the Forest is often uncertain. Many acres of Forest land are unavailable for public use because of insufficient access. Current emphasis is on acquiring ROW's where access-related problems are greatest and where property owners are most willing to grant or sell easements.

Soils and Geology

Soils on the Shoshone National Forest are complex, reflecting the wide range of geologic types (parent material), topographic features and ecological conditions that exist. Vegetation patterns, landforms, and soil characteristics (such as natural erosion rates) vary tremendously within short distances across the landscape.

Accelerated erosion (man-caused) is estimated to be approximately 400,000 tons per year. This includes roads, trails, range improvement projects and harvesting activities. Most management takes place on soil, landform and vegetation communities that have inefficient sedimentary delivery properties. Hence, much of this erosion does not move into the water system. The Forest currently has a backlog of 900 acres in declining watershed condition.

The objective of soil management on the Forest is to match management activities to the capability and suitability of the soil to assure long-term productivity. This can be done where the soil has been inventoried and soil characteristics are known. Presently, about 45 percent of the Forest soil survey has been completed.

Facilities

The Shoshone National Forest has 1,583 miles of roads and 1,294 miles of trails on its system. In the past, roads on the Forest have been developed primarily for timber and prospecting access. Most system roads currently being constructed on the Forest are associated with timber sales. The relatively high mileage of trails and low mileage of roads, when compared to other Forests, reflect the predominately wilderness and roadless nature of the Shoshone National Forest.

Of the 1,583 miles of roads in the system, 29 percent are classified as arterial or collector type and the remaining 71 percent are local roads.

Of the 1,294 miles of existing trails on the system, 31 percent are classified as being inadequate and needing either reconstruction or relocation and new construction. Sixty percent or 776 miles of these trails are located within the Forest's wildernesses and primitive areas.

There are currently eleven administrative sites within the Forest Boundary, and one adjacent to the boundary but on BLM land. Nine of these sites serve as Ranger Stations and work centers. The Wapiti Ranger Station is occupied year round and the remaining administrative sites are used seasonally. Existing structures are generally adequate for their intended use. New water systems are needed at four sites. New waste water systems will be necessary in the future at three sites.

Currently there are no major transmission utility or water transmission corridors on the Forest. There are approximately 40 miles of microwave paths.

Protection

The fire management program on the Forest is a coordinated interagency effort involving federal, state and county organizations in northwestern Wyoming. The Forest is also the Coordination Center for all federal, state and county organizations that have cooperative fire agreements in the State of Wyoming. The objective is to provide a cost-efficient fire use and protection program that responds to multiple use resource management goals. During the period 1971-1980, a total of 5282 acres were burned by wildfire.

The long-term goal of the integrated pest management program is prevention rather than emergency suppression of insects and diseases. A variety of silvicultural activities can help prevent insect and disease problems. They include clearcutting, slash disposal, site preparation for regeneration, commercial and precommercial thinning, timber stand improvement and partial cutting. It is important to identify and prioritize timber stands according to susceptibility to insects and disease so the highest risk stands are scheduled for treatment first. This will help ensure the maintenance of a healthy forest condition.

The Forest Service has statutory responsibility for enforcement of federal laws and regulations on Forest lands. The Forest, in cooperation with state, local and other federal law enforcement agencies, maintains a law enforcement program aimed at attaining compliance with laws and regulations, protection and safety of Forest users, and protection of government property and Forest resources.

Air

The management of the air resource on the Forest, in response to the Clean Air Act (as amended), is directed toward maintenance of public health and welfare, and preservation or enhancement of recreational, historic or scenic values. Clean, clear air is valued by most Forest visitors as a part of their experience travelling through or recreating on the Forest. Other Forest resources, particularly in wilderness areas, are dependent upon clean air and are valued not strictly in human terms, but also carry intrinsic value (Wilderness Act of 1964). Protection of air quality related values, such as visibility, water quality, vegetation, is mandated for wilderness on about 50 percent of the Forest.

Wild and Scenic Rivers

The Clarks Fork of the Yellowstone River has been evaluated and recommended for designation as a wild river in an EIS dated February, 1979. This recommendation received administrative approval and was introduced in Congress on September 13, 1982. A Federal Energy Regulatory Commission (FERC) withdrawal with an application for hydroelectric facility construction is pending on Sunlight Creek which is a tributary of the River. Since construction of this facility could affect the character of the River, there is some concern about its protection prior to inclusion in the system. The protection period expired September 13, 1985. The Wiggins Fork of the Wind River was evaluated and did not qualify for addition to the National Wild and Scenic Rivers System.

Research Natural Areas

There are no designated Research Natural Areas (RNA's) on the Shoshone National Forest at this time. Five sites have been inventoried and are proposed for designation as an RNA. These sites are:

1. Picketts Knob Whitebark pine site - 300 acres
2. Pat O'Hara Douglas fir site - 300 acres
3. Bald Ridge Limber pine site - 200 acres
4. Twin Lakes Alpine ecosystem site - 722 acres
5. Peatbeds permafrost site - 160 acres

A number of sites, including Meadow Lakes, have been inventoried as possible RNA's. Their suitability for inclusion will be determined at some future time.

ENVIRONMENTAL CONSEQUENCES

Direct, Indirect, and Cumulative Environmental Effects

Environmental consequences are the anticipated effects of applying management practices to land areas. Consequences vary for each alternative because different mixes of practices produce different levels of resource outputs, and as a result, different effects on various environmental factors.

Environmental consequences of implementing the alternatives are described in physical, biological, social and economic terms. These consequences can be direct, indirect and cumulative. Direct effects occur at the same time and place as the initial management activity. Indirect effects are those which occur either later in time or at a different location. Indirect effects often result from the interaction between Forest resources and management activities. Cumulative effects are those that result from a multiplicity of impacts through time or within a given area.

Table 4 summarizes the physical and biological effects on selected resources compared to the first decade condition under current management, or compared to the current trend, as noted. If no significant effect is expected to occur on an environmental factor under any alternative, that factor is not shown in the table.

Social and Economic Effects

Table 5 displays the economic impacts of alternatives in regard to estimated changes in population, number of jobs, and total income due to the effects of Forest Management.

The ranking of alternatives in terms of beneficial economic impacts is the same for both economic impact areas; Alternative B is best and then D, F, C, A and E. All economic impact indicators follow this progression with one exception. The exception is Alternative C in the northern economic impact area. In this case, there is a relatively larger change in population and significantly lower impact on unemployment than in other alternatives.

Alternative C de-emphasizes commodities in order to focus on preservation of the Forest for enhancement of recreation, watershed and wildlife values. Workers necessary for supporting increases in recreation must migrate in, leaving unemployed those currently unemployed in sectors associated with timber production and ranching.

Present net value (PNV) is a comparison of monetary values associated with Forest products and the cost of Forest management. The higher the PNV, the greater is the benefit compared to the cost. The ranking of alternatives from the highest to the lowest PNV is as follows: F, B, D, A, C and E. The difference between the highest and the lowest is 25 billion dollars, or about six percent of the total PNV for Alternative F. Alternative PNV's for B, D, A and C cluster within three percent of the value for Alternative F.

Social effects of Alternative A are slightly negative. It would continue current policies on oil and gas development which is a major force polarizing local communities, particularly those in Park County. Alternative A responds

TABLE 4

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
VEGETATION								
Conifer Cover Type	Percent of Total Conifer Acreage 1/							
0-20 age class		21	9	14	8	8	2	8
20-40 age class		0	9	14	9	8	2	8
40-60 age class		0	15	16	14	15	10	15
60-80 age class		0	11	10	10	14	10	10
80-100 age class		3	0	0	0	1	0	0
100-120 age class		9	0	0	0	0	0	0
120-140 age class		0	2	0	1	1	1	2
140+ age class		45	32	24	36	32	53	35
All Age		22	22	22	22	22	22	22
Aspen Cover Type	Percent of Total Treatable Aspen Cover Type which is under Periodic Treatment	NA	70	76	74	70	40	68
Sagebrush Cover Type	Percent of Total Treatable Sagebrush Cover Type which is under Periodic Treatment	NA	33	34	30	37	16	32
Riparian Cover Type	Percent of Total Riparian Cover Type which is Managed	NA	All riparian cover type is managed with standards and guidelines in all alternatives.					

TABLE 4 (Continued)

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
RECREATION								
Primitive Nonwilderness	MACRES 1/	12	12	0	5	15	20	12
Semiprimitive Nonmotorized Nonwilderness	MACRES 1/	360	381	521	585	457	556	468
Semiprimitive Motorized	MACRES 1/	348	354	253	167	319	230	291
Roaded Natural	MACRES 1/	281	278	260	284	250	197	272
Rural	MACRES 1/	23	23	11	11	11	22	11
VISUAL								
Preservation VQO 2/	MACRES 1/	1413	1422	1610	1654	1589	1493	1670
Retention VQO	MACRES 1/	742	732	549	508	578	787	514
Partial Retention VQO	MACRES 1/	201	227	220	209	216	123	208
Modification VQO	MACRES 1/	63.2	47.5	48.5	56	44	27	35
Maximum Modification VQO	MACRES 1/	16.5	1.5	1.5	1.5	1.5	1.5	1.5
WILDERNESS								
Pristine Wilderness	MACRES 1/	138	146	139	135	159	139	151
Primitive Wilderness	MACRES 1/	714	735	769	710	740	565	658
Semiprimitive Wilderness	MACRES 1/	556	501	472	535	482	677	572
WILDLIFE								
Direct Habitat Improvement	ACRES/YR 3/	NA	376	467	492	467	277	434
WATER								
Water Yield Increase	AC-FT/YR 3/	2690	4150	4910	3770	4000	1850	3870
Sediment Yield Increase	MTONS/YR 3/	24.9	27.5	25.6	17.6	24.5	8.04	25.8
Water Quality, Wetlands, and Floodplains	Net change in risk of cumulative effects from current	NA	No Change	Decrease	Decrease	Decrease	Decrease	Decrease
	Relative risk of cumulative effects	NA	Very High	High	Very Low	Moderate	Low	High

TABLE 4 (Continued)

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
SOILS								
Erosion Increase	MTONS/YR 3/	399	385	338	177	322	76	330
FACILITIES								
Roads	Net change in wear from current trend	NA	No Change	Increase	Increase	Increase	Decrease	Decrease
Trails	Net change in wear from current trend	NA	No Change	Increase	Increase	Decrease	Decrease	No Change
AIR								
Air Quality	Net change in risk of air pollution from current trend	NA	No Change	No Change	Decrease	Decrease	No Change	No Change

1/ at the end of fifty years, MACRES = thousand acres

2/ VQO = visual quality objectives

3/ average annual over fifty years, MTONS = thousand tons

TABLE 5

Forest-Related Population, Income, and Employment Impacts[1]

	Population	Personal Income (Million Dollars)	Property Income (Million Dollars)	Total Income (Million Dollars)	Employment (Number of Jobs)	Unemployment (Percent)	Payments to Counties (Million Dollars)
Fremont Economic Impact Area							
Total	33,637	109.0	69.	178.0	9516	4.00	
Forest-Related (1977 Base)	429	2.28	1.44	3.73	284	---	
Changes from Forest-Related Base by Alternative (1990 Index Year)							
B	+750	+2.14	+1.36	+3.49	+277	-0.68	.1165
D	+710	+2.02	+1.27	+3.28	+265	-0.67	.1048
F	+692	+1.96	+1.24	+3.2	+259	-0.66	.1045
C	+677	+1.87	+1.13	+2.99	+253	-0.65	.0803
A	+624	+1.8	+1.15	+2.94	+238	-0.64	.1075
E	+294	+0.72	+0.34	+1.05	+117	-0.34	.0393
Park Economic Impact Area							
Total	12,600	70.28	108.1	178.3	6701	3.84	
Forest-Related(1977 Base)	246	2.48	1.57	4.06	290	---	
Changes from Forest-Related Base by Alternative (1990 Index Year)							
B	+710	+3.37	+2.27	+5.64	+419	-0.60	.0953
D	+686	+3.24	+2.17	+5.42	+406	-0.60	.0857
F	+666	+3.13	+2.11	+5.24	+395	-0.60	.0855
C	+670	+3.12	+2.01	+5.13	+395	-0.54	.0657
A	+626	+2.94	+2.01	+4.95	+374	-0.60	.0880
E	+392	+1.69	+1.00	+2.69	+231	-0.32	.0322

1/ Data on the economic structure of the two economic impact areas came from the data base developed nationally to support the IMPLAN computer program (see Appendix B). Employment data was derived from County data gathered by the State of Wyoming and the U.S. Census Bureau.

favorably to issues and concerns of producing commodities at the lowest production costs possible. Only legal minimum standards would be met, with minimum coordination requirements for production of timber, oil and gas, and forage for domestic livestock.

Social effects of Alternative B are negative. It emphasizes production of commodity outputs, including oil and gas. This type of emphasis proves to be the most polarizing and would have a negative effect on local social systems. This alternative responds favorably to issues and concerns related to commodity production and support of local industries dependent on that production. It also provides for the least possible restrictions on oil and gas development, responding favorably to issues and concerns related to energy production and self-sufficiency.

Social effects of Alternative C are positive. It emphasizes production of noncommodity outputs with standards on production of commodities to maintain and enhance wildlife habitat, recreation, watershed and visual resources. This type of emphasis proves to be the least polarizing and would have a positive effect on local social systems. Commodity values could be produced at lower levels, but local dependent industries would still be supported.

Social effects of Alternative D are positive. It emphasizes production of noncommodity outputs with standards on production of commodities to maintin and enhance wildlife habitat, recreation, watershed and visual resources. Production of commodities is kept at or near existing levels. This combination of emphasizing noncommodity goods and services while producing levels of commodities necessary for maintaining local dependent industries would have the greatest positive effect on local social systems.

Social effects of Alternative E are negative. Though it appears to emphasize noncommodity goods and services, the long term quality of those goods and services would deteriorate. This, combined with providing little support for local dependent industries, would have a negative impact on social systems.

Social effects of Alternative F are negative. It emphasizes production of commodity outputs, including oil and gas. This type of emphasis proves to be the most polarizing and would have a negative effect on local social systems. This alternative responds favorably to issues and concerns related to commodity production and support of local industries dependent on that production. It also provides for the least possible restrictions on oil and gas development, responding favorably to issues and concerns related to energy production and self-sufficiency.

The most significant difference between alternatives is the application of standards and guidelines for commodity production. In Alternatives A, B, E and F, those standards and guidelines are generally at the minimum necessary to meet coordination requirements and legal minimum standards except in areas managed to enhance grizzly bear habitat. Alternatives C and D apply standards and guidelines in order to enhance the quality of noncommodity goods and services provided, or to lower the risk of effects on other resources from commodity production. This responds to major issues and concerns dealing with the unique features of the Forest and its location. The Forest borders two National Parks and is part of the greater Yellowstone area. Alternatives C and greatest productive capacity. Alternative D does this in a way that also meets the Forest's share of Regional and National demands for most commodity goods and services.

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The alternatives incorporate sustained yield of resource outputs while maintaining productivity of the resources. Implementation of the specific direction and mitigation measures included in the Forest Direction and Management Prescriptions are intended to ensure that long-term productivity would not be impaired by the application of short-term management practices.

Alternatives A, B, D and F would have the highest level of short-term commodity-oriented uses and therefore would have higher levels of short-term consequences such as visual impacts and increased sedimentation. The risk of long-term impairment due to cumulative impacts is higher in these alternatives. The alternatives in order of decreasing levels of short term uses, are A, F, B, D, C and E, where C and E are substantially lower than any of the others. The risk of impairment in any alternative is local in nature and not Forest-wide, discounting the development of one or more major oil and gas fields on the Forest.

The management area prescriptions and effects of the alternatives would be monitored to provide data to assure that standards for long-term productivity are met. Monitoring requirements and standards would apply to all alternatives (See Chapter IV of the Forest Plan).

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The term "irreversible commitment of resources" describes a loss of future options. It applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods of time. Measures to protect resources that could be irreversibly affected by other resource uses were incorporated in the Forest Direction management requirements and apply to all alternatives.

Irretrievable commitment of resources is defined as the loss of production or use of natural resources because of an allocation decision, or opportunities foregone for the period of time that a resource cannot be used. Allocation decisions that forego the production or use of renewable resources for relatively long periods of time include ski area development, road construction and developed recreation site construction. These commitments are irretrievable, in the sense that opportunities are foregone, rather than irreversible, since some could be reversed - although perhaps not without great expense.

Decisions regarding resource use or nonuse in each alternative represent irretrievable commitments of resources, but the time in which the commitments can be reversed is variable. For example, a decision to manage an area for nonmotorized recreation or not to allow domestic livestock grazing in an area represents an irretrievable commitment of resources which can be reversed in a relatively short period of time. Harvesting a mature stand of timber means that the habitat provided for old growth dependent species of wildlife is lost for the period of time required to grow another mature stand; the loss is reversible, but not for 100 to 120 years. By most reasonable standards, such an effect would be termed irreversible. The amount of land area involved in long term irretrievable, but reversible, commitments of resources through such actions as timber harvest, and road and facility construction is minor, Forest-wide, though these can have dramatic local effects.

Though past levels of oil and gas exploration and development opportunities have also been minor on the Forest, recent trends indicate that such activities could increase significantly over the next ten years. Such activities involve irretrievable commitments of both surface and subsurface resources. Placement of a well in an area can cause a loss of some types of visual and recreation opportunities, and production of oil and gas from a well causes loss of the mineral resource from the Forest. This commitment of subsurface resources is plainly irreversible. Most, if not all, of the losses of surface resources can be reversed if there are no accidents such as spills or pipeline breaks, or if access roads and facilities fit the capability of the land for rehabilitation. If an exploratory well does not find producible quantities of oil or gas, losses can be reversed in a relatively short period of time through complete rehabilitation of the well site and access roads. Where production of oil or gas is initiated, the losses can be reversed through similar actions, but only after production ceases in 10 to 50 years. Full field development, involving a number of wells and roads, could delay total rehabilitation in an area for an indefinite period of time. As with timber harvesting, the lengthy time span required to return an area to its former condition may be considered an irreversible commitment depending on what is considered a "reasonable amount of time" for rehabilitation.

With production of oil and gas, unlike other uses of the Forest, there is a risk of loss of some surface resources beyond a reasonable or forseeable amount of time. This can happen through such accidents as spills, pipeline breaks, or leaching of toxic chemicals that could affect soil productivity, vegetation, water quality and aquatic habitat. The chance of such accidents is partially dependent on the standards under which operations are conducted. Though the chances of major accidents causing irreversible effects may be slight, there is concern over this possibility.

An issue of major concern to many users of the Forest is the commitment of resources for oil and gas exploration and development. About 40 percent of the Forest is available for oil and gas leasing and development opportunities. This means that the potential impacts of oil and gas activities could affect a significantly larger proportion of the Forest than development or use of any other marketable Forest resource such as timber or livestock forage. For this reason, alternatives vary in their treatment of oil and gas. All alternatives include provisions for protection of some surface resources, at least at levels considered minimally acceptable, on affected sites. All alternatives allow for exploration and development of all areas available for oil and gas leasing, according to appropriate lease stipulations.

Alternatives C and D, however, include more stringent recommended operating standards that would minimize the loss of such resources as dispersed nonmotorized recreation settings, visual quality, and wildlife habitat. They also reduce the risk of cumulative impacts on soil, water and related aquatic values that would be irreversible or irretrievable. These alternatives provide the lowest opportunity cost in terms of surface resource commitments, in line with intent to emphasize noncommodity values.

The development of roadless areas represents an irreversible commitment of potential wilderness resources. Each of the alternatives involves development in some roadless areas. Providing a balanced mix of recreation opportunities was a prime consideration in the design of Alternatives C and D. Therefore demand for wilderness recreation was considered in these alternatives.

ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Implementation of any of the alternatives would result in some adverse environmental effects that cannot be avoided. However, application of the management requirements in Chapter III of the Plan is intended to limit the extent and duration of these effects, or to ensure that legal minimum standards are met. Monitoring and implementation procedures given in Chapter IV of the Plan are key to ensuring proper application of requirements and minimizing adverse effects.

The degree or severity of the adverse effects can be minimized by adhering to the direction in the management area prescriptions, but some impacts cannot be avoided. The expected unavoidable adverse impacts are summarized below.

Fire Management

Subsequent to logging and thinning operations, there will be temporary increases in fire hazard and control difficulty due to timber residues. Also, the fire risk will increase as a result of more people using an area during and after management activities. This effect will be mitigated by earlier detection and suppression, resulting in more fires controlled at small acreages. In the long term, fire hazard will be decreased through vegetation management activities as areas with accumulated natural fuels are put under management and fuel continuity is reduced.

Air Quality

The air quality will diminish on a local and temporary basis due to various management activities. Burning timber harvest debris piles, timber hauling and recreation traffic on untreated roads and the operation of internal combustion engines will adversely impact the air quality where these activities occur.

Impacts on air quality related values in Class I areas could be categorized as both irreversible or irretrievable resulting from the long term cumulative effects of airborne pollutants whose source is outside wilderness, on or off the Forest.

Water Quality and Wetlands

Sediment resulting from management practices is considered the most prevalent pollutant material in Forest streams. Project activities such as road building and use, vegetation management and soil disturbance will contribute sediment to adjacent streams. In some instances, short term reduction of water quality may violate state water quality standards. In other cases, where it may not be practical to build roads outside of wetlands or floodplains, Forest Service goals for water quality maintenance or enhancement may not be met (FSM 2520).

Grazing of domestic and transportation livestock in riparian areas could adversely affect the hydrologic and physical character of such areas and induce physical, chemical and biological changes in water quality. Developed and dispersed recreation can contribute to the same adverse effects. Some such impacts are unavoidable without comprehensive programs of monitoring and administration, and full time commitment of administrative personnel.

Minerals activities, including oil and gas, will produce some of the same adverse impacts as above, but in addition holds the potential for pollution by toxic or other hazardous materials. Spills and leaks of hazardous materials during development and production of oil and gas are unavoidable to a degree. In many areas of the Forest, spills and leaks would unavoidably affect water quality or wetland character.

Soils

Loss of vegetation cover, soil compaction and erosion will occur in some areas in association with road construction, timber harvest, grazing or other developments, Adequate project planning and soil program management would limit effects to acceptable levels.

Wildlife

Increased human activities in project areas may temporarily disturb or displace wildlife. Roads and road use may have a longer lasting impact on wildlife due to human activities associated with access into areas that were previously unroaded, or improved access into areas that previously had low standard unsurfaced roads.

Mineral development will cause a direct loss of wildlife habitat on the Forest for the duration of the activitiy. Measures will be taken to mitigate the loss of habitat following mining.

Fisheries

Road building and use, timber harvest and other ground disturbing activities will increase silt loads in streams which may temporarily displace fish, reduce trout reproductive success and alter aquatic microinvertebrate populations in stream sections receiving heavy concentrations.

Livestock Forage

Riparian area protection would remove some areas that are presently grazed from term permitted use by livestock. Mineral activities will affect livestock forage for ten to fifty years as these acreages are removed from production. Mitigation measures will provide for establishment of forage on these areas to equal or exceed pre-mining levels.

Timber harvesting or timber stand improvement in natural barriers may affect livestock distribution and control and could cause a need for additional range structural improvements.

Tree Stand Management

Some trees will be lost to mortality and others will not be harvested due to old growth requirements for wildlife, soil protection on steep slopes and other Forest Direction.

I. PURPOSE AND NEED

CHAPTER I

PURPOSE AND NEED

INTRODUCTION

This final Environmental Impact Statement (EIS) discloses a proposed action, as well as alternatives to that proposed action, for managing the Shoshone National Forest for the next ten to fifteen years. The EIS describes the environment to be affected and the potential environmental consequences of implementing the proposed action and each alternative. The proposed action is described in detail in the accompanying Shoshone National Forest Land and Resource Management Plan (Forest Plan or Plan).

The alternatives presented in these documents contain specific management actions for the plan period. The plan period is defined by the NFMA regulations as one decade (36 CFR 219.3), while the law permits a 15 year maximum (16 USC 1604 (f) (5)). Within the plan period conditions on the Forest will be reanalyzed and a revised plan developed (36 CFR 219.10 (g) (1982) and (16 USC 1604 (f) (5). Management actions, outputs, and environmental and socio-economic effects for several decades beyond the plan period are also discussed for each alternative. The purpose of these discussions is:

- To present a long-term analysis for decision makers and the public of the management necessary for each alternative to achieve and maintain, in perpetuity, a high level of regular periodic outputs of various resources without impairment to the productivity of the land (16 USC 531).

- To provide a link to the Resource Planning Act (RPA) program which requires information for four decades beyond the plan period (16 USC 1602). For RPA linkage, a complete estimate of outputs, costs, and effects for the RPA time horizon is required.

The projection of alternative attributes beyond the plan period, although required by law, does not legally bind the Forest to action beyond the plan period since as noted above, the Forest is required to revise the Plan within 15 years of its development and this revision may establish different long-term goals with different future projections.

The aim of the planning process is to arrive at a decision among alternative ways to manage the Forest and its resources. The decision involves selecting a mix of goals, objectives, practices, and standards and guidelines that best responds to identified issues, concerns, and opportunities (ICO's) and maximizes net public benefit (net public benefit is discussed below). Alternatives are defined and evaluated in this EIS with respect to environmental consequences and desired outputs, all within the context of ICO's. The Forest Supervisor recommends a preferred alternative to the Regional Forester in the accompanying Forest Plan. The Regional Forester will review the Plan and environmental documentation and either approve or disapprove the Plan. A decision of approval will be documented in a published Record of Decision (ROD, National Forest Management Act 36 CFR 219.10(c), see discussion below).

An environmental impact statement is not a decision document. It is a disclosure document dealing with the environmental consequences of implementing the proposed action and alternatives to the proposed action. The significant environmental effects of the proposed action and alternatives on lands administered by the Shoshone National Forest, and on lands administered by state, local, and other federal agencies are disclosed in this EIS. Other federal, state, and local agencies have assisted in disclosure of environmental consequences and development of alternatives to the proposed action. Agencies which cooperated in the preparation of this document are listed in Chapter VI.

Preparation of an environmental impact statement is required by the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations found in Title 40, Code of Federal Regulations, Part 1500 (40 CRF 1500), and the implementing regulations of the National Forest Management Act (NFMA) in 36 CFR 219. The EIS is prepared in the format established in 40 CFR 1502.10 of the CEQ regulations. For purposes of NEPA disclosure, this EIS and all its appendices, the Forest Plan and all its appendices, and the Record of Decision are treated as combined documents (40 CFR 1506.4).

A Notice of Intent to prepare an environmental impact statement for the Shoshone National Forest Plan was published in the Federal Register on November 14, 1980. Revised Notices of Intent were published in the Federal Register on August 25, 1983 and December 17, 1984.

Chapter VII of this EIS is a glossary of terms used in this document and the Forest Plan. Chapter VIII is an index and Chapter IX is a list of references consulted in preparing the Forest Plan and EIS.

NATIONAL, REGIONAL AND FOREST PLANNING

The planning process, as specified in the implementing regulations of NFMA, was followed in developing the proposed action and alternatives to it. The planning process uses an interdisciplinary approach to develop the proposed action and the alternatives (36 CFR 219.5). The planning actions described in the regulations (36 CFR 219.12(b) through (k)) and used in this Forest planning process are the following:

1. Identification of Purpose and Need
2. Planning Criteria
3. Inventory Data and Information Collection
4. Analysis of the Management Situation
5. Formulation of Alternatives
6. Estimated Effects of Alternatives
7. Evaluation of Alternatives
8. Preferred Alternative Recommendation
9. Plan Approval
10. Monitoring and Evaluation

All of the documents and files that chronicle the Forest planning process are readily available for inspection during regular business hours at the Shoshone National Forest Supervisor's Office, West Yellowstone Highway, Cody, Wyoming. These planning records detail information and decisions used in developing the

Forest Plan as required in 36 CFR 219.10(h). Planning records and results of each planning action are incorporated by reference in the text and in the appendices of this EIS and in the Forest Plan and Plan appendices.

Preparation of the Forest Plan is required by the National Forest Management Act of 1976 which amends the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974. The NFMA regulations are found in 36 CFR 219 and cited throughout this EIS. Forest planning occurs within the overall framework of both national and regional planning as structured by laws and implementing regulations. Through the National RPA Program, the Regional Guide establishes management standards and guidelines, attempts to resolve regionally significant issues and concerns, and assigns tentative outputs and activities (RPA targets) to the Forests within the Region. The question of achieving assigned RPA targets and resolving local-area issues and concerns is addressed in the Forest Plan. Implementation of the Forest Plan will assure multiple use, sustained yield, and protection of Forest resources; compliance with regulations; and consideration of local, regional, and national issues. The Plan will be revised at least every 15 years as specified in 36 CFR 219.10 (g).

The purpose of the Plan is to guide management of the Forest for the next ten to fifteen years. The overall goal of the Plan is to provide direction for maximizing net public benefits by achieving a healthy, vigorous forest environment capable of facilitating a wide range of natural processes and human activities.

Net public benefit is the long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs). Not all benefits and costs can be quatitatively measured in the same terms. Some are direct dollar costs and benefits, others are related to the impact of management on local and regional economies and social structures. As such, net public benefit is not a quantitative measure that can be objectively applied. Rather it requires a careful analysis of the physical, biological, economic and social effects that are possible from management of the Forest including consideration of the unique features of the Forest and their benefit to the American public. In order to capture the full range of possible effects and then identify the set of effects that would maximize net public benefits a wide range of analysis was done. Results of this analysis are presented in this document.

This EIS prepared for the Forest Plan will be used in preparing future Environmental Assessments (EA's) and Environmental Impact Statements (EIS's) through tiering in accordance with 40 CFR 1502.20 and 1508.28. A result of tiering will be that EA's and EIS's prepared for projects arising from the Plan will often refer to the environmental analyses in the EIS, Forest Plan, and associated documents rather than repeat information. Environmental documents for specific projects will therefore be shorter and concentrate on issues unique to each project.

Environmental assessments and environmental impact statements, when needed, will supplement the Forest Plan Environmental Impact Statement. Future environmental analyses will use the Forest Plan management direction as an umbrella. Additional detail will be included in the environmental documents for future project-level decisions.

Changes in schedules or activities required by the Plan will necessitate a Forest Plan amendment. Such changes in the Plan may not be considered significant by the Forest Supervisor and may be implemented by amendment following appropriate public notification and completion of NEPA procedures (36 CFR 219.10[f]). Significant amendments or revisions necessary to accommodate changes in demands or proposed actions requires an EIS. Such amendments or revisions can be recommended by the Forest interdisciplinary team at any time, or at least every fifteen years, based upon the monitoring and evaluation process (see Chapter IV, Plan). The Forest Supervisor can require Plan revision when RPA goals, policies or objectives would significantly affect Forest level programs under the current Plan. A significant change requires the Forest Supervisor to follow the same procedures as that used in developing the Forest Plan. Significance and the need for an EIS is determined by applying criteria found in 36 CFR 219 and 40 CFR 1508.27.

Materials Incorporated by Reference

All direction for guiding management of the Forest is to be included in the Forest Plan. Some of the standards and guidelines for management refer to standards devleloped by the Forest Service as listed in manuals and handbooks. Other standards for management refer to standards developed in other environmental analyses on the Forest. These are included in Chapter III of the Forest Plan in Forest Direction and Management Area Direction. The basis for these standards includes the following materials.

Whiskey Mountain Bighorn Sheep Comprehensive Management Plan

> This document is available for inspection at the Forest Supervisor's office in Cody, Wyoming. This plan coordinates the efforts of the Wyoming Game and Fish Department, the U.S. Forest Service and the Bureau of Land Management in managing the Whiskey Mountain bighorn sheep winter range unit. The goals of cooperative management via this plan are to perpetuate a bighorn sheep herd for sport hunting, esthetics, transplant stock, and for educational and scientific pursuits.

Shoshone Geophysical Investigations Environmental Assessment

> This document was mailed to interested publics and individuals. It is available for inspection at the Forest Supervisor's office and district offices of the Shoshone National Forest. The document discloses the potential environmental consequences of issuing permits to conduct geophysical exploration on the nonwilderness portions of the Forest using alternative types and levels of mitigation. The Decision Notice accompanying the assessment describes the selected alternative and lists the procedures and mitigation measures applied to geophysical permits and activities.

Big Horn Basin 208 Water Quality Management Plan

> This document is available for inspection at the Forest Supervisor's office in Cody. Copies may also be available through the Wyoming State Department of Environmental Quality in Cheyenne. This plan identifies water quality problems or potential problems in the Big Horn Basin, and suggests measures to be used for controlling or eliminating the problems. It also identifies management agencies and institutional arrangements for implementing the suggested abatement measures. Lands and management practices of the Shoshone National Forest are involved in all phases of this plan.

Memoranda of Understanding with other Agencies

These documents are available for inspection at the Forest Supervisor's office in Cody. Examples include a memorandum between the U.S. Forest Service and the Wyoming Department of Environmental Quality detailing their cooperative roles in developing and implementing the Water Quality Management Plan. A memorandum between the Forest Service and the Wyoming Game and Fish Department governs cooperative efforts regarding wildlife habitats and populations. Similar memoranda or interagency agreements exist between the Forest Service and other agencies such as the BLM regarding minerals management, and the U.S. Fish and Wildlife Service for Threatened and Endangered Species management.

Dunoir Special Management Unit Direction (P.L. 92-476)

This document is available for inspection at the Forest Supervisor's office. It directs that management of the area will emphasize protection of the existing wilderness resource characteristics, perpetuating natural conditions and permitting only those uses that are compatible. The Wyoming Wilderness Act of 1984 reaffirmed this management direction for the Dunoir area.

Wyoming Wilderness Act of 1984

This document is available for inspection at the Forest Supervisor's office. The Act establishes two new wildernesses and adds acres to two existing wildernesses on the Forest. It establishes one wilderness study area and reaffirms the present status of the Dunoir area.

Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area

This document is available for inspection at the Forest Supervisor's office and at other agency headquarters involved in grizzly management in the Yellowstone area. The intent of the document is to serve as a basis for conserving grizzly bears and their habitat while sustaining the flow of other wildland resources. The guidelines for management of each resource are grouped according to those that maintain or improve habitat, minimize grizzly-human conflict potential, or resolve grizzly-human conflicts.

Clarks Fork of the Yellowstone River Wild and Scenic River Study Final Environmental Statement

This document was mailed to interested publics and individuals and is further available for inspection at the Forest Supervisor's office. It evaluates alternatives regarding possible inclusion of the Clarks Fork River in the National Wild and Scenic Rivers System. The free-flowing nature and scenic, recreational, and historic characteristics are described, along with environmental, social, and economic effects of implementing each alternative. The preferred alternative recommends Wild River designation of about 21.5 miles of river, and presents likely management practices and constraints associated with the designation.

Wyoming Oil and Hazardous Substances Pollution Contingency Plan

This document is available for inspection at the Forest Supervisor's office. Copies may be obtained through the Wyoming State Department of Environmental Quality. This plan describes appropriate procedures for reporting, containing and cleaning up spills or discharges of hazardous substances.

Shoshone National Forest Water Resource Monitoring Plan

This document is available for inspection at the Forest Supervisor and district offices on the Forest. This plan presents the Forest's monitoring objectives. It provides detailed guides for monitoring network design, sampling frequencies and intensities, analysis and reporting requirements, sample parameters and cost evaluation in relation to stated objectives.

IMPLEMENTATION OF THE PROPOSED ACTION

The management direction contained in the Forest Plan (Plan Chapter III) is the basis for all programs and projects carried out on the Forest. The management direction is implemented through the program development, budgeting, annual work planning, and monitoring processes. These processes supplement the Forest Plan and result in annual adjustments needed to reflect current priorities within the overall management direction contained in the Plan.

Management direction is composed of three parts (36 CFR 219.3):

1. multiple-use and other goals and objectives,

2. management prescriptions associated with the multiple-use and other goals and objectives, and

3. standards and guidelines for attaining the multiple-use and other goals and objectives.

A comprehensive set of goals was developed early in the Planning process to define the range of desirable Forest conditions that would respond in various ways to all issues, concerns, and management opportunities (ICO's). The selection of appropriate mix of these goals through the planning process, has resulted in a set of goals for the Forest Plan.

A management prescription is the management practices selected and scheduled for application on a specific area of the Forest to attain multiple-use and other goals and objectives (36 CFR 219.3). A set of management prescriptions was developed for each area of the Forest. These sets provided a full range of resource production and environmental protection levels to be analyzed. Through the analysis process presented in this EIS, a particular management prescription was selected for each area of the Forest as the proposed action.
The standards and guidelines, referred to in general as management requirements, which control how practices scheduled in management prescriptions will be carried out are in two parts, Forest Direction and Management Area Direction. Forest Direction consists of management requirements which are generally applicable to the entire Forest. Management Area Direction contains management requirements specific to individual areas within the Forest and are applied in addition to the Forest Direction management requirements.

Implementation of management prescriptions and standards and guidelines is key to translating the goals and objectives stated in the Forest Plan into on-the-ground results.

Management direction contained in the Forest Plan guides development of multi-year implementation programs for each Ranger District. The Plan's management prescriptions are translated into multi-year program budget proposals which specifically identify the activities and expenditures necessary to achieve the direction provided by the Forest Plan. These implementation programs form the basis for the Forest's annual program budget.

Upon approval of the final budget appropriation for the Forest, the annual program of work is finalized and implemented on the ground. The annual work plan provides the detail to the program budget proposals necessary to guide managers and their staffs in responding to the direction of the Forest Plan. The activity files in the data base and the Program Accounting and Management Attainment Reporting System provide information on monitoring the accomplishment of the annual Forest program.

As soon as practicable after the Plan is approved, the Forest Supervisor will ensure that, subject to valid existing rights, all outstanding and future permits and other occupancy and use documents which affect National Forest System lands are consistent with the Plan. The management direction contained in the Forest Plan is used in analyzing proposals by prospective Forest users. All permits, contracts, and other instruments for occupancy and use of the National Forest System lands covered by this Plan must be consistent with the Plan. This is required by 16 USC 1604(i) and 36 CFR 219.10(e).

Subsequent administrative activities affecting National Forest System lands, including budget proposals, shall be based on the Plan. The Forest Supervisor may change proposed implementation schedules to reflect differences between proposed annual budgets and actual funds received. Schedule changes resulting from the budget appropriation process will be considered an amendment to the Forest Plan. The final annual budget allocation for the National Forest will serve as documentation of the amendment. Changes resulting from the budget appropriation process shall not be considered a significant amendment, and will not require the preparation of an environmental impact statement. Budget changes which, over time, significantly alter the long-term relationships between levels of multiple use goods and services projected in the Forest Plan will be evaluated in conjunction with the update of the RPA Program every five years and may result in an amendment or revision of the Forest Plan.

FOREST LOCATION

The area administered by the Shoshone National Forest contains 2,433,125 acres of land. It is an administrative unit of the Rocky Mountain Region of the Forest Service, U.S. Department of Agriculture. It includes large portions of Fremont and Park Counties, and smaller portions of Sublette, Teton and Hot Springs Counties, Wyoming (Figure I-1). The Forest is divided into five subunits: Clarks Fork, Greybull, Lander, Wapiti, and Wind River Ranger Districts (Figure I-2). Table I-1 displays land ownership acreages by county.

Figure I-1 Vicinity Map

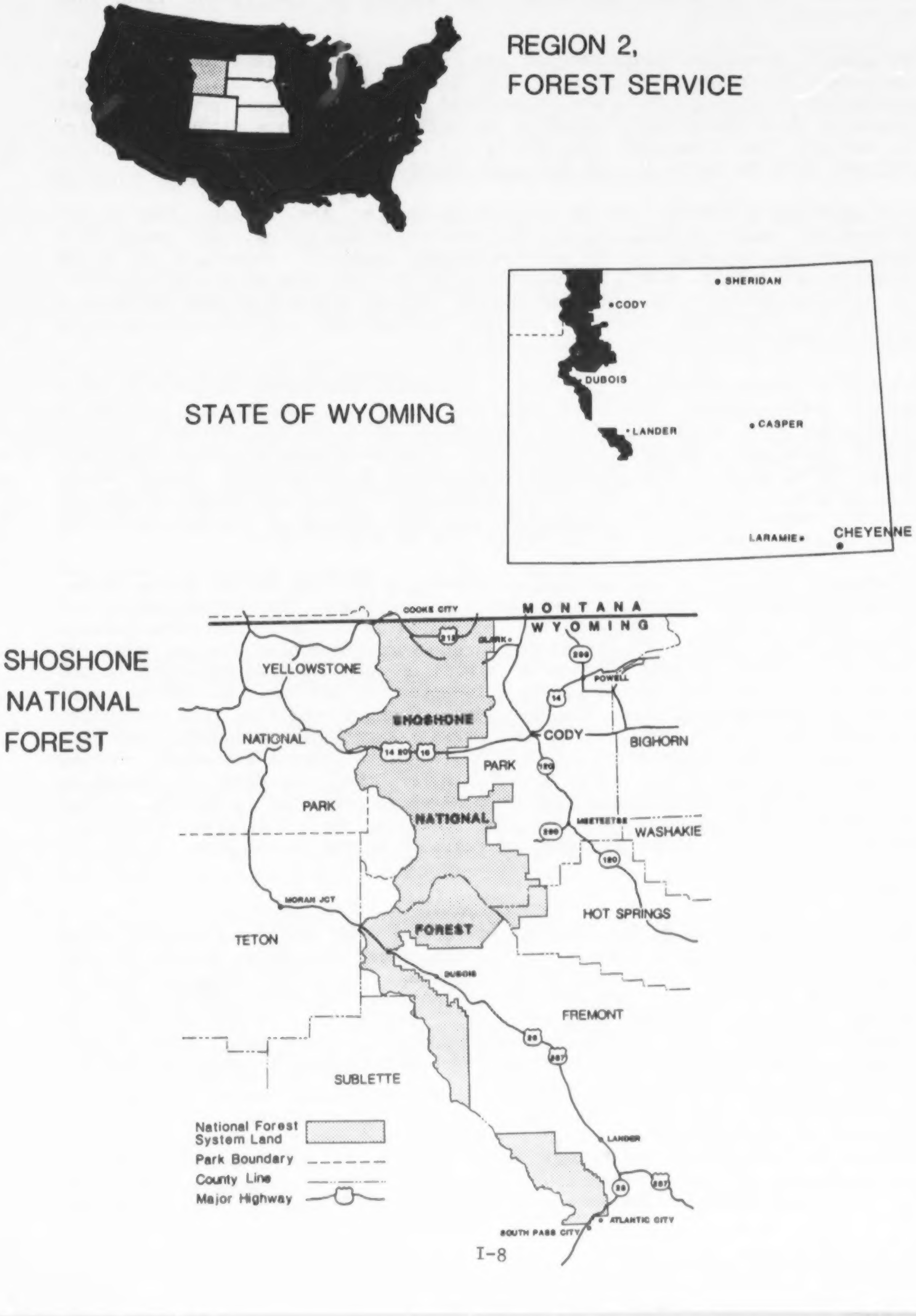

REGION 2,
FOREST SERVICE
STATE OF WYOMING
SHERIDAN
CODY
DUBOIS
LANDER
CASPER
LARAMIE
CHEYENNE
SHOSHONE
NATIONAL
FOREST
COOKE CITY
MONTANA
WYOMING
212
CLARK
296
POWELL
14
YELLOWSTONE
SHOSHONE
NATIONAL
14 20
16
CODY
BIGHORN
PARK
120
PARK
NATIONAL
MEETEETSE
290
WASHAKIE
120
MORAN JCT
HOT SPRINGS
TETON
FOREST
DUBOIS
FREMONT
26
287
SUBLETTE
National Forest System Land
Park Boundary
County Line
Major Highway
LANDER
28
287
ATLANTIC CITY
SOUTH PASS CITY

FIGURE I-2 RANGER DISTRICT LOCATIONS

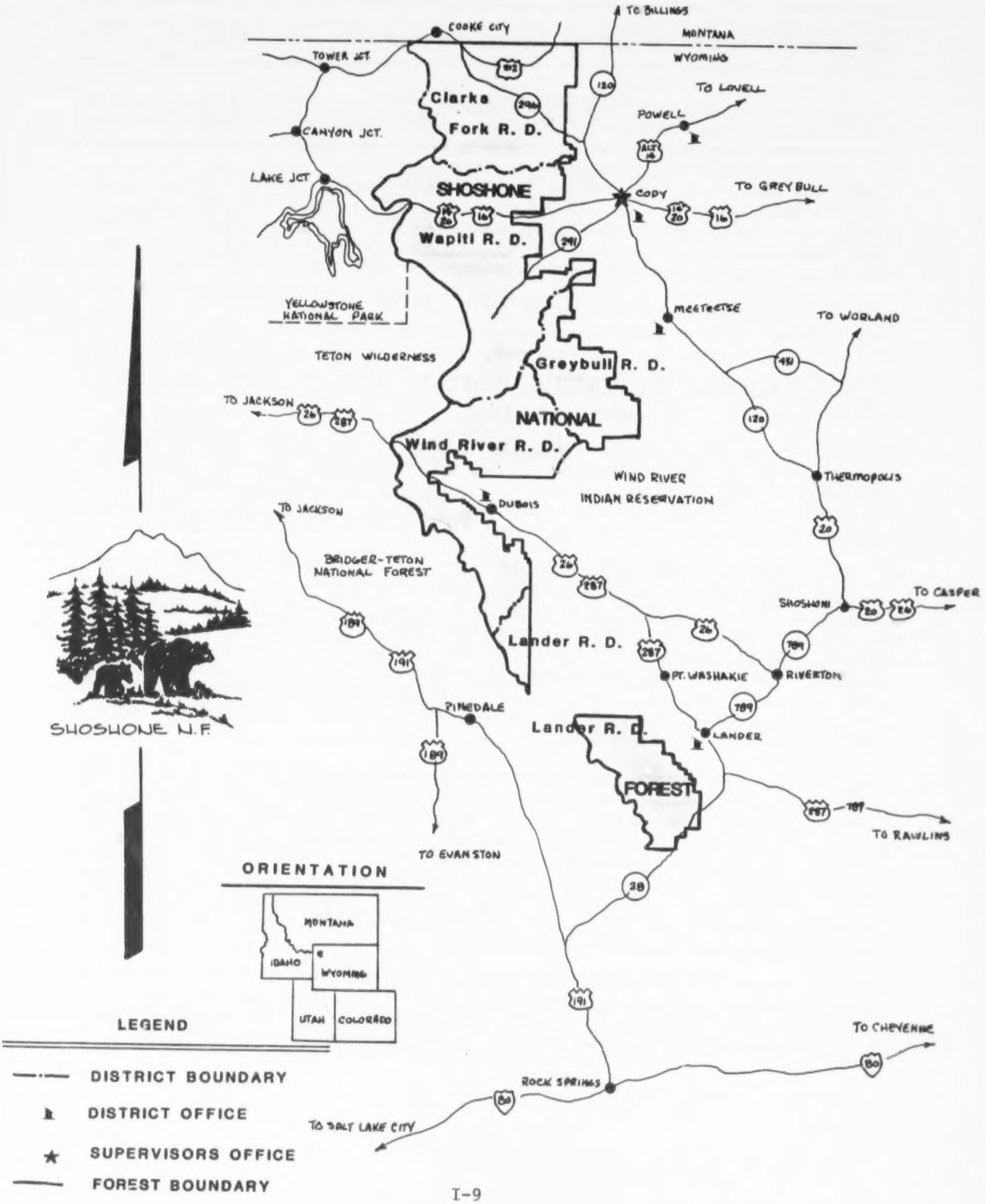

TO BILLINGS
COOKE CITY
MONTANA
WYOMING
TOWER JCT.
212
120
TO LOVELL
Clarks
Fork R. D.
296
POWELL
ALT 14
CANYON JCT.
LAKE JCT
SHOSHONE
CODY
TO GREYBULL
14 20
16
14 20
16
Wapiti R. D.
291
YELLOWSTONE NATIONAL PARK
MEETEETSE
TO WORLAND
TETON WILDERNESS
431
Greybull R. D.
TO JACKSON
26
287
NATIONAL
120
Wind River R. D.
WIND RIVER INDIAN RESERVATION
THERMOPOLIS
DUBOIS
TO JACKSON
20
BRIDGER-TETON NATIONAL FOREST
26
287
TO CASPER
SHOSHONI
20
26
189
26
Lander R. D.
287
789
191
FT. WASHAKIE
RIVERTON
PINEDALE
789
Lander R. D.
LANDER
189
FOREST
287
789
TO RAWLINS
TO EVANSTON
28
ORIENTATION
MONTANA
IDAHO
WYOMING
UTAH
COLORADO
191
SHOSHONE N.F.
TO CHEYENNE
80
ROCK SPRINGS
80
TO SALT LAKE CITY
LEGEND
DISTRICT BOUNDARY
DISTRICT OFFICE
SUPERVISORS OFFICE
FOREST BOUNDARY

TABLE I-1

Shoshone National Forest Acreage Summary (Acres Within Forest Boundary)

County	National Forest System	Other Ownership	Total Area Within Boundary
Fremont	845,745	7,090	852,835
Hot Springs	54,388	200	54,588
Park	1,520,644	25,682	1,546,296
Sublette	9,696	0	9,696
Teton	2,862	0	2,862
Total	2,433,125	32,972	2,466,297

ISSUES, CONCERNS AND OPPORTUNITIES IDENTIFIED PRIOR TO DRAFT ENVIRONMENTAL IMPACT STATEMENT

Public issues are subjects or questions of widespread public interest relating to management of the National Forest System. Management concerns are issues, problems or conditions which limit the range of management practices identified by the Forest Service in the planning process. Management opportunities pertain to the capability of the Forest to respond to issues and concerns.

The purpose of identifying issues and concerns addressed in this EIS is to determine the quality and quantity of goods, services, uses and environmental conditions that people want from the Forest. In the initial phase of the planning process, issues and concerns were identified through a review of past public involvement efforts and through contact with networks identified by District Rangers. When the review was completed, federal, state, and local agencies and the public were asked to validate existing issues and to define new issues. These public issues and management concerns determine the scope of the EIS (40 CFR 1501.7 and 1508.25).

The public issues and management concerns were grouped according to content. From these groupings, eleven planning problem statements were developed to represent the major public issues and management concerns that the proposed action and the alternatives would address. A detailed discussion of this process is in the Planning Action One Report: "Public Issues, Management Concerns, Management Opportunities and Management Prescriptions for the Forest Plan" as amended, and in Appendix A. Appendix A also details the issues and concerns included in planning problem statements and describes the relationships between issues and concerns.

It is important to note that the planning problems are not mutually exclusive. Rather, there are direct, indirect and inverse relationships involved. This underlines the complexity of the management job, and the paramount need to bring a thoroughly integrated approach to defining and solving problems.

The following summarizes the public issues and management concerns included in each planning problem statement and briefly assesses the management opportunities available to address issues and concerns. (Further detail regarding resource opportunities are included in Chapter II of the Forest Plan, in the Planning Action Four report: "Analysis of the Management Situation" and in the Planning Records.)

Planning Problem Statement #1 - Balanced Timber Management for Multiple Resource Needs. Issues and concerns include those pertaining to maintaining a healthy forest, healthy local economy, and to reducing conflicts between timber management and other activities. Timber management and associated roads can reduce visual quality and other recreational values. Similarly they can reduce wildlife habitat quality and contribute to loss of important habitat components. Timber harvest and roads can produce conditions that decrease the productivity of soils and the quality of water. On the other hand, such activities can enhance habitat for some wildlife species and provide access for many activities including recreation.

Currently there are eight sawmills using timber from the Shoshone National Forest. Most of these mills are processing less than one million board feet per year. Most mills also depend to some extent on timber from sources other than the National Forest System. In many cases, the timber available to these mills is less than their capacity. Public attitudes toward timber harvesting are currently divided. Many publics feel timber harvesting on low productivity lands, such as the Shoshone National Forest, is inappropriate. Many local residents favor increased timber harvesting in order to maintain a healthy forest and a healthy local economy. The mountain pine beetle is a continuing problem in many lodgepole pine stands.

Planning Problem Statement #2 - Adequate Variety, Amount, Dispersion and Quality of Recreation Opportunities. Issues and concerns include those pertaining to: conflict between incompatible recreation activities such as cross-country skiing and snowmobiling; development of resource management practices which are compatible with recreation opportunity settings; access and resource use conflicts; and perceived quality of recreation opportunities. The quality and amount of dispersed, nonmotorized forms of recreation where solitude and natural conditions are key can be reduced by the presence or evidence of livestock, by the presence of trailbikes or snowmobiles, and by the evidence of timber harvest or mineral exploration. Both motorized and nonmotorized recreation can adversely affect wildlife, or even be critical to wildlife at some times or in some places. Snowmobilers, trailbikers and other ORV groups may perceive that there is insufficient opportunity for pursuing their recreational choices on the Forest because of road and area closures. Closures are implemented for a variety of purposes including wildlife protection, watershed protection, and reduction of road maintenance expenses. These problems exemplify the complex nature of the management problem and how a truly integrated approach to management is required. The concern and the management challenge is to provide a mix of recreation opportunities that is satisfactory to the public that facilitates the efficient management of other resources, and that provides resource protection where necessary.

Pressure on the Forest to provide accomodations for visitors to Yellowstone National Park is increasing. With the proposed improvement of the Wapiti and Clark's Fork roads, demand for camping at the east and northeast Park entrances will become greater. The question of how much the Federal government should provide versus private capital will continue to be asked. Demand for commercial outfitter services will continue to increase, compounding the problem of outfitters operating without a permit.

Demand for suitable off-road vehicle (ORV) areas and other motorized recreation opportunities are increasing. There is a need to expand and improve the limited winter recreation programs forest-wide. Additional demands are expected on lodges and resorts for both expanded and improved destination type services as users become more conscious of fuel conservation needs. Demand for other resource uses such as oil and gas exploration and development, domestic livestock grazing, and timber harvesting conflict with some recreation uses of the Forest. These conflicts are polarizing public attitudes towards management of the Forest.

Planning Problem Statement #3 - Adequate Level and Kind of Livestock Grazing. Issues and concerns include those pertaining to resource use conflicts, range resource management, economically dependent ranchers, and kind of livestock use (sheep versus cattle). Improper livestock use can compete with wildlife for crucial winter range and conflict with some recreation uses, such as dispersed wilderness use. Excessive or overly concentrated grazing can damage some soil properties that lead to increased erosion and sedimentation. Excessive use in riparian areas can bring about drastic changes in that ecosystem by vegetation type conversion, stream bank failure and physical, chemical and biological alterations in water quality. Opportunities do exist, however, to improve current grazing management and reduce livestock conflicts with other Forest resources. Use of intensive management systems can do much to make livestock grazing more compatible with other uses. Some ranchers having Forest grazing permits are economically dependent on these permits for the continuation of their operations. Demands for sheep grazing is declining; pressure to convert to cattle grazing on many sheep allotments is increasing.

Planning Problem Statement #4 - Manage Wilderness to Best Satisfy Legal Requirements and Public Needs. Issues and concerns include those pertaining to conflicting use of wilderness resources, quality of wilderness values and experiences, and effects of fire policy and commodity related activities in or adjacent to wilderness.

Grazing in wilderness is not accepted by many wilderness recreation users as being compatible, since it represents evidence of man's activity. These users contend grazing and evidence of grazing can lower the quality of wilderness resources, such as soil, vegetation and water, as well as the quality of the recreation experience. On the other hand grazing is a viable wilderness use according to the Wilderness Act of 1964. Therein lies the conflict and the concern from the standpoint of both desired recreation opportunity and maintenance of livelihood. On a somewhat smaller scale, a similar conflict can occur between individuals or small groups and large, horse-supported groups including outfitters and guides. The management concern is to accomodate all such desires and uses at a high level of quality, and protect the sensitive wilderness ecosystems and habitats in a economically efficient way. Though not a major problem at this time, minerals development in wilderness is a management concern and a potentially volatile issue.

There are currently five wildernesses and one wilderness study area on the Forest. Passage of the Wyoming Wilderness Act of 1984 added 142,238 acres to existing wilderness for a total of 1,379,048 acres (56.7 percent of the Forest net acreage). An additional 14,700 acres was established as the High Lakes Wilderness Study Area. The Dunoir (28,987 acres) was not classified as wilderness, but the provisions of P.L. 92-476 still apply. The result of the Wyoming Wilderness Act of 1984 is that two areas remain unresolved; the High Lakes Wilderness Study Area and the Dunoir Special Management Unit. The Act delays resolution of the High Lakes area (10-15 years from 1985). The Dunoir Special Management Unit was kept in the status of P.L.92-476. Both areas must be managed for retention of their wilderness characteristics, knowing each area has varying activities that may take place prior to final resolution (See direction for Management Areas 10E and 10F, Chapter III of the Forest Plan).

Public attitudes toward wilderness management are divided. Many users favor a wilderness with few or no developments while others are demanding more comforts and conveniences such as trails. Conflicts among users and uses are occurring as wilderness visits increase. Off-forest developments such as gas sweetening plants may affect wilderness air quality and other related values. Some opportunities for cooperative management of the Whiskey Mountain bighorn sheep herd are forgone with designation of the Glacier Primitive Area as part of the Fitzpatrick Wilderness. Public attitudes on wilderness management will continue to be divided.

Planning Problem Statement #5 - Adequate Level of Road and Trail System Development and Maintenance. Issues and concerns include those that pertain to the number, mileage, and design standard of roads and trails, maintenance of existing facilities, standards for construction and the need for obliteration and revegetation on some roads. They also pertain to the need for motorized and right-of-way access to public land for various purposes. Immediate concerns relate to motorized recreational use from the standpoint of resource protection and maintenance of the transportation system with a shrinking budget. The discussion under problem statement two elaborates these concerns.

In the past, roads on the Forest have been developed primarily for timber and prospecting access. Most of the system roads currently being constructed on the Forest are associated with timber sales. The relatively large mileage of trails and small mileage of roads, when compared to other Forests, reflect the predominately wilderness and roadless nature of the Shoshone National Forest. Some resource damage has occurred in the past from poorly constructed and maintained roads, failure to properly rehabilitate abandoned roads, and driving on closed roads. In the past few years, several abandoned roads have been rehabilitated to halt or prevent erosion and for wildlife purposes.

Demand is increasing on the Forest for recreational road access for motorized recreation and trailhead access. Much of the Forest has little or no right-of-way access through private lands adjacent to the Forest. Use of the private lands within and adjacent to the Forest is intensifying. The result is that rights-of-way and easements are becoming more difficult to obtain.

Planning Problem Statement #6 - Adequate Levels and Quality Habitat for Wildlife and Fish. Issues and concerns include those pertaining to the number of wildlife and fish available for consumptive and nonconsumptive uses, and conflicts between wildlife and Forest users, and uses that tend to decrease habitat quality and quantity. The major concern or conflict revolves around the treatment of winter range for elk, deer, sheep and moose that is considered crucial to herd maintenance. There is a direct conflict between the protection for forage and security in such areas and providing forage for cattle, opportunities for motorized recreation (such as snowmobiling) and access to year-round operations like oil and gas exploration and production facilities.

Most big game populations are considered to be at or near the carrying capacity of the key winter ranges at the present time. Fisheries have generally been increased primarily due to stocking programs by the Wyoming Game and Fish Department. There has been some habitat loss due to competing land uses such as livestock grazing, road construction, mineral exploration, and fire control and by natural causes such as loss of aspen stands. Seasonal wildlife distribution patterns (primarily elk) have changed in areas such as the South Fork of the Shoshone River due to increased recreation. The demand for both consumptive and nonconsumptive wildlife use can be expected to increase significantly in the next decade. The amounts and methods of predator control will continue to be a controversial issue necessitating increased coordination with the U.S. Fish and Wildlife Service, Wyoming Game and Fish, Forest Service Research, wildlife organizations, and livestock owners.

Planning Problem Statement #7 - Manage Threatened and Endangered Species Habitat to Achieve Recovered Populations. Issues and concerns include those pertaining to management practices that affect grizzly bear, bald eagle, gray wolf, peregrine falcon, and black-footed ferret. As in the discussion of Problem 6, the major concern involves protection of areas that are critical to these species. These areas include not only nesting or denning sites, but protection of their food sources. Since these species are basically predators, the additional concern is to protect the habitat of other wildlife species (including small game) and fish upon which they depend. Such protection is in conflict with many other uses of the Forest, the most notable of which is probably recreation (both developed and dispersed). Oil and gas activities (including seismic studies) and timber harvest, both highly dependent on road construction and use, are potentially in conflict with threatened and endangered (T&E) protection. Large-group, horse-supported camps and developed public and private recreation near occupied grizzly bear habitat produces grizzly/human conflicts that sometimes results in human injury or fatalities and nearly always results in the loss of the bears from the ecosystem.

Areas of suitable habitat for peregrine falcons have been mapped on the Forest. Bald eagles are occasionally sighted on the Forest and their habitat has been delineated. Reintroduction of the gray wolf may occur on the Forest when the Recovery Plan for that species is implemented. A population of black-footed ferrets has been found within three to five miles of the Forest Boundary.

Considered a part of the Greater Yellowstone Area for grizzly bear management, the Shoshone National Forest contains one-half million acres of "essential grizzly habitat" and one million acres of "occupied grizzly habitat". The

Shoshone National Forest, along with five other National Forests and Yellowstone and Grand Teton National Parks, have cooperated in developing and implementing "Guidelines for Managing Grizzly Bear Habitat" and the "Grizzly Bear Recovery Plan". The primary objective of the guidelines and recovery plan is removing the grizzly bear from threatened status. Restrictions that are imposed to meet this objective inhibit other Forest uses such as grazing and commercial outfitting.

Planning Problem Statement #8 - Adequate Quality, Quantity and Timing of Water Yields for Forest and Non-Forest Uses and Other Downstream Uses off Forest. Issues and concerns include those pertaining to timing, available storage of existing and increased quantities of water, instream flow needs, maintenance of water quality, watershed management techniques and administration of water on and off the Forest. Water quality can be affected by all commodity-oriented activities on the Forest, and by some noncommodity activities such as dispersed recreation. Changes in water quality can affect water uses quite distant from the source of the impact. Water quality can also be lowered significantly, to the point of violating quality standards for various uses, by the cumulative impact of many activities that individually are of little consequence. The major concern is to avoid changes in water quality that will significantly affect water uses or violate standards. The major issue or management challenge is to define acceptable levels of management, and where and when various management practices can occur to address that concern.

The Shoshone National Forest produces an annual average yield of over three million acre feet of water per year. Historically, little consumptive water use has occurred on the Forest, with the exception of some recreation (campground), stock developments, and administrative water uses. Off-forest water use, however, is expected to increase with population growth, increased energy water use, and additional irrigation developments. Most of the rivers flowing off the Forest eventually flow into large multipurpose hydroelectric irrigation reservoirs. The Forest can expect additional demands for increased diversions and reservoir development, due to the suitability of a number of sites for that purpose.

The Forest has a large instream flow requirement for ecosystem maintenance, fisheries, wildlife, livestock use and aesthetics. Instream quantities for maintenance of favorable conditions of flow have been provided by the recent Big Horn Adjudication (see Chapter III, Water).

Planning Problem Statement #9 - Adequate and Appropriate Fire Management - Issues and concerns include those that pertain to protection of private property within or adjacent to the Forest, increasing fuel loads, initial attack responsibilities, and effects of present fire management policies. The issue is: to what degree is protection needed, considering various land uses and considering fire as a component or regulator of the ecosystem. The management concern is to bring policy and expenditures into line with those considerations, and define the conditions under which suppression is truly necessary.

An analysis of the present and projected fire situation on the Forest indicates that wildfire risk can be reduced by reducing fuel loads with increased fuelwood gatherering, road closures and improved timber management practices. Vegetation management through the use of fire is now being used to accomplish other resource objectives. Naturally occurring fires can also be used to manage vegetation and maintain desired ecosystem conditions, especially for those in which fire is a natural, periodic event.

Planning Problem Statement #10 - Appropriate Level of Rights-of-Way Acquisition, Land Adjustments and Special Land Uses - Issues and concerns include those that pertain to conflicts between private land owners and people who want additional access to public land, land-line location and trespass issues in subdivision areas, and special use needs that accompany increasing population and resource development.

The land ownership pattern of the Shoshone National Forest is such that about 33,000 acres of state-owned and private land lie within its boundaries. As recreation use increases and user values change, many landowners have fenced their lands and locked their gates. Landowners have realized benefits through charging fees for use of their private roads for access to National Forest System and other public lands. Recreationists and other Forest users are now more mobile and aware of their rights. They are looking to the Forest Service to step up right-of-way acquisition programs to insure access to public lands. It is expected that landowners will continue to lock their gates and prohibit access. Conflicts between landowners and recreationists will increase as recreation use increases. In addition, access needs and Forest landline location activities will expand in association with intensified management of various other resources such as timber, forage and minerals.

Planning Problem Statement #11 - Mineral Exploration, Development and Extraction - Issues and concerns include those pertaining to the exploration for and development of leasable and locatable minerals, reclamation of disturbed areas, needs for Forest access to support minerals and other activities, conflicts with other resource uses and values, and social effects of rapid development. A concern is that all phases of mineral operations can have long term adverse consequences on wildlife habitat and populations, including T & E species. They can also severely disrupt visual and aesthetic qualities of an area. A wide range of impacts on aquatic ecosystems and water quality is possible from individual sites, spill events or the cumulative effects of development. Another concern is that opportunities for positive economic impacts and energy development or discovery of new major sources of oil and gas may be foregone. At issue is the relative importance of surface resource values and qualities, aesthetics, and energy supplies. The frame of reference for the issue is both local and national.

The recent activities in oil and gas exploration have created a disruptive issue within local communities. Polarization has occurred between those portions of the community dependent on oil and gas and those portions dependent on other Forest resources associated with recreational, wildlife, or scenic values.

As of September 1982, there were approximately 300 existing oil and gas leases on the Forest. Lease applications numbering 140 are pending. On pending leases, determination must be made regarding areas leased, areas withdrawn, and lease stipulations that will protect or restore surface values. There are no producing wells on the Forest although several have been drilled and capped, and several producing wells exist just outside the boundary. Mineral experts indicate certain areas on the Forest have a reasonably high potential for producing oil and gas (see Chapter III, Minerals). There are eight areas on the Forest where hard-rock mineral exploration and some mining have occurred. As mineral values increase, and as production methods become more cost-effective, it is expected that known mineral deposits will be developed and the amount of prospecting will increase. These developments could affect wilderness management.

Miles of seismic lines permitted annually have increased from 12 miles in 1980 to 297 miles in 1983. A total of 694 miles were permitted over the past three years. Within the next year, the Forest anticipates it will receive 10-20 applications for permit to drill (APDs) for oil and gas exploration and development.

ISSUE IDENTIFICATION FOLLOWING THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

During the comment period, 185 letters were received commenting on the Proposed Plan and Draft Environmental Impact Statement. Most of these letters center around issues identified early in the planning process (which were used to develop the Planning Problem Statements above). However, the letters also reveal, along with other developments and new information, that there are at least two new issues. These are: management of the greater Yellowstone area and the timber harvest level as it relates to local economies in Lander and Dubois. These new issues could be summarized as follows:

Greater Yellowstone Area. There is a widespread call to examine management of the greater Yellowstone area and ensure that management plans of all the different entities involved are coordinated. Recent publicity of this issue and Congressional Hearings have raised it to being an issue of widespread concern and interest.

This issue is addressed throughout both the Plan and EIS. Maintaining the viability of ecosystems is not a new concern in Forest Planning. It has been a concern that led to the establishment of the National Forest System, is embodied in a number of laws governing National Forest Management, and is explicitly included in the regulations governing Forest Planning. There are many ecosystems on the Forest. Some are major vegetation systems such as forested ecosystems, grassland ecosystems, and aquatic ecosystems. Some are only partially on the Forest, such as those related to migratory wildlife including deer, elk, and grizzly bear. All alternatives provide for maintaining the viability of each of these systems. The coordination efforts in this regard are discussed in detail in Chapter VI, Consultation (see Volume II), under the heading SUMMARY OF PUBLIC COMMENT, Greater Yellowstone Area.

Timber Harvest Level in Fremont County. A timber mill in Lander was concerned about its ability to remain viable given harvest levels in the proposed Plan. This prompted a shift in harvest in the preferred alternative to better support this mill (see Chapter VI, response to comment 80-2).

Harvest levels in the proposed Plan affecting timber mills in Dubois vary little from historic levels. This means that viability of these mills will be affected little by the Shoshone Forest Plan. However, preliminary information regarding proposed harvest levels on the Bridger-Teton National Forest indicates a significant reduction from historic levels. This has caused concern in Dubois. This concern has not been addressed because the Bridger-Teton has not yet published a proposed Plan. Shoshone National Forest will reanalyze harvest levels and impacts on community stability following publication of the Bridger-Teton National Forest proposed Plan (see Chapter VI, response to comments 105-1, 163-2, and 163-5).

In addition to these "new" issues, many letters revealed new aspects of previously identified issues and areas of confusion within this set of documents. These areas, summarized below, are discussed in detail in Chapter VI (see Volume II) under the heading SUMMARY OF PUBLIC COMMENTS.

Oil and Gas Leasing and Operations

- Some felt that the decision not to lease grizzly bear Situation 1 lands was a new and unwarranted decision.
- Some felt that leasing of grizzly Situation 2 lands should be eliminated by the Plan.
- There were concerns that oil and gas considerations were not included in analysis of alternatives.
- Some felt that seasonal protection of crucial preferred winter range for wildlife was too little and that a no-surface-occupancy stipulation should be added for all winter range.
- Some thought that decisions on specific leases should be made in the Plan, while others thought that such decisions were made in the Plan.
- There was confusion relating to "isolated tracts."

Timber

- Some felt that given the insects and disease problems on the Forest, timber harvest levels should be increased.
- Some felt that timber harvest levels in the Proposed Plan would threaten wildlife and degrade recreation.

Wildlife

- Some felt that production levels of timber and forage for domestic livestock combined with new construction of roads and the probable stipulations and operating standards for oil and gas activities threatened the viability of wildlife populations on the Forest.
- Some felt that too much forage was taken from domestic livestock to support wildlife; too little timber was harvested to provide for the successional stages required by wildlife; and that wildlife restrictions on oil and gas operations were more than what would be required to adaquately protect them.
- A number were concerned that Wyoming Game and Fish Department herd unit targets for the North Fork herd units were not met in any alternative.
- Some were concerned about being able to continue current management of the Whiskey Mountain Bighorn Sheep population and habitat. This area was classified as wilderness in 1984, and many practices that have been done

in the past, such as habitat improvement and use of motorized equipment, are not normally allowed in wilderness areas.

Roads

- There was confusion over the amount of new roads to be constructed on the Forest and many felt that too many new roads were being proposed.
- Some felt that access to the Forest would still be a problem.

Recreation

- Some felt that timber harvest, oil and gas operations, and new roads as proposed, would have a detrimental effect on recreation.
- There was confusion over recreation capacity, probable recreation use levels, and recreation quality as discussed in the DEIS and Proposed Plan.

Water

- Some felt that wetlands and riparian areas should be separated out as a separate resource rather than being combined with water resource discussions.

Time Period

- Some felt that situations change too rapidly for a planning horizon of fifty years to be viable and called for a ten year plan.

Special Areas

- Some felt there should be more Research Natural Areas and that the proposed sizes for some were too small.
- Nine potential National Natural Landmarks were identified that were not included in the Proposed Plan.

Monitoring

- Many pointed out the importance of monitoring and felt that the monitoring requirements and past funding were inadaquate.

Between release of the DEIS/Proposed Plan and issuance of the FEIS and Forest Plan many aspects of the analysis and documentation were revised. These revisions address all of the above items and changes occured in many sections of both the EIS and Plan. Changes in the EIS are summarized below. Changes in the Plan are summarized in Chapter I of the Plan.

CHANGES BETWEEN THE DRAFT AND FINAL EIS

Based on comments received, a new benchmark was added and all alternatives were reformulated and analyzed. The new benchmark maximized the amount of wilderness on the Forest. This had been done in original analysis but was deleted when the Wyoming Wilderness Act was passed in 1984. Discussions of benchmarks in Chapter II and Appendix B have been updated based on this.

The major analysis questions dealt with oil and gas considerations, timber harvest, and roads associated with timber harvest. Upon examination of procedures used for including oil and gas leasing and operations in analysis, no change to the procedures was indicated. However, discussions throughout Chapter II, IV, and Appendix B were rewritten to clarify and address the number of questions related to this area.

When the analysis procedure for timber was examined, a change in procedure was indicated. This was in the area of accounting for roads associated with timber harvest. This change in analysis procedure resulted in a need to reanalyze the maximum PNV benchmark and all alternatives. Generally, this reanalysis resulted in a decrease in the acres managed for timber, a decrease in road needs, and a decrease in the long-term sustained yield levels for timber. Timber harvest levels for the next ten years did not change significantly in any alternative, however. Changes were made to Chapter II and IV, and Appendices B and C in the EIS; as well as to Appendices A, B, C, and D in the Plan based on this new analysis of timber.

Reformulation and analysis of alternatives affected many other resource areas as well. In most cases, the changes were not significant. Both the EIS and Plan were extensively revised to incorporate those changes and to clarify points that appeared to cause confusion. In chapters where significant changes have been made, these changes are discussed in the chapter introduction.

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

CHAPTER II

ALTERNATIVES INCLUDING THE PROPOSED ACTION

OVERVIEW

This chapter describes alternatives explored in planning. The first section discusses criteria used in formulation of alternatives including regulatory direction from the National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA). This section also includes a discussion of benchmarks and how they were used to help formulate alternatives. The second section presents alternatives. It includes a discussion of alternatives considered but eliminated from detailed study. Alternatives considered in detail are described. The final section compares alternatives considered in detail.

SUMMARY OF CHANGES BETWEEN DRAFT AND FINAL EIS

During the ninety day comment period on the DEIS and Proposed Plan, over 180 letters commenting on these documents were received by the Forest. Many of these letters contained concerns and suggestions as to how analysis and alternatives could be changed to better respond to issues, concerns, and opportunities. As a result of these letters, changes in analysis models were made and all alternatives were reanalyzed.

In response to comments and concerns, construction and reconstruction of roads were examined. It was determined that much of the concern was based on unclear discussions within the documents regarding the amount of new road construction. These discussions have been clarified. However, during this examination, it also appeared that there was an inaccurate accounting of roads and road costs in the analysis model. These inaccuracies were rectified and resulting changes in the model were shared with a number of analysts both within and outside the Forest Service. Changing the analysis model altered the amount of roads indicated as necessary for each alternative as well as the budget needs for construction, reconstruction, and maintenance. The net effect is a decrease in new road construction within each alternative.

A companion issue to the road issue was the amount of area that would be accessed for timber harvest. Timber harvest levels, the schedule for timber harvest, and analysis of areas suited for timber management were reexamined for all alternatives. In general, harvest levels in the first ten years remained about the same for each alternative as they were in the DEIS. The major changes in harvest levels occured in later decades and were generally lower for each alternative in these later decades than as shown in the DEIS. Even though timber harvest levels in the first ten years remained fairly consistent with the harvests reported in the DEIS, the amount of land managed for timber decreased in all alternatives. For the preferred alternative, for example, there was about a 15 percent decrease in the number of acres that are classified as suited for timber management.

As an outcome of this reanalysis and in response to public comments, some areas that had been planned for timber harvest and road construction in alternatives in the DEIS are now not scheduled for such harvest or road construction. This means that road construction is now not planned for some areas that are currently roadless. This decision is based on current conditions of supply and demand and will be reanalyzed when the`Plan is revised some time in the next ten to fifteen years.

A number of comments addressed the use of fire as a management tool. In response to these comments, the potential role of fire was reexamined. This resulted in more liberal fire precriptions is all alternatives, allowing fire to play more of its natural role in maintaining the health of ecosystems on the Forest. As a result of this reanalysis, it was determined that some of the multiple-use benefits associated with the timber program could not be accomplished through use of fire. In areas where the management intent is to open small patches within solid blocks of timber to improve wildlife habitat and vegetative diversity, control of fire to accomplish this task would be more expensive than accomplishing the same mosaic through timber harvest.

A number of comments were concerned about the economics of timber harvest; calling for no below-cost timber sales. For this reason, the entire area of timber economics was reexamined. This included a reanalysis of timber roads and their related economic considerations. This reexamination was a partial reason the long-term sustained yield of all alternatives decreased and the amount of land in the suited timber base decreased for all alternatives. If prices for timber remain at current levels (these levels are about the same as timber prices in the period of 1972 to 1982), then the timber management program in all alternatives more than pays for itself when considering costs directly attributable to timber and the stumpage prices received. No multiple-use benefits were included in this calculation even though such benefits will be produced.

As a result of reanalysis of all alternatives and in response to public comments, many outputs and effects of alternatives changed. However, beyond those mentioned above, such changes were minor. Such changes are discussed in Chapter VI on a comment by comment basis.

ALTERNATIVE DEVELOPMENT PROCESS

The major purpose in formulation and analysis of Forest Plan alternatives is to identify how the Forest should be managed in order to maximize "net public benefits". Net public benefit is the long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs). Not all benefits and costs can be quatitatively measured in the same terms. Some are direct dollar costs and benefits, others are related to the impact of management on local and regional economies and social structures. As such, net public benefit is not a quantitative measure that can be objectively applied. Rather it requires a careful analysis of the physical, biological, economic and social effects that are possible from management of the Forest including consideration of the unique features of the Forest and their benefit to the American public. In order to capture the full range of possible effects and then identify the set of effects that would maximize net public benefits a wide range of analysis was done. This included developing 18 benchmarks and a set of alternatives that captured the best that the benchmarks had to offer. Results of all of this analysis are presented in this document.

A Forest Plan alternative is a plan of work for managing the Forest. Each alternative is designed to produce a specific mix of outputs and effects through time including wildlife habitat, timber, forage for domestic livestock, water and a variety of recreation opportunities. To produce these outputs, a set of practices is selected for application to specific parts of the Forest for each alternative. There are two types of practices involved. One type of practice is selected to produce specific forest conditions necessary for production of outputs and effects. These include vegetation treatments such as treating sagebrush and aspen to increase and maintain wildlife habitat or silvicultural treatments to increase and maintain the vigor of forested ecosystems. The other type of practice directs use of the Forest so that desired outputs and effects of an alternative can be met. These practices include such things as administration of recreation areas, construction of fences to control use, and management of roads and trails.

A coordinated set of practices for a specific area of the Forest is referred to as an analysis area prescription or FORPLAN prescription. Such a prescription includes the costs of practices to be applied and estimates of outputs and effects which would result from application of the listed practices to a specific area. Each FORPLAN prescription is a multiple-use "mini-plan" designed for a specific area of the Forest. These specific areas are called analysis areas. The Forest was subdivided into 109 analysis areas. Some analysis areas are very complex. To capture the full range of management possibilities on such areas up to 58 separate FORPLAN prescriptions were developed. Other analysis areas are less complex and required only three or four separate FORPLAN prescriptions to capture the full range of management possibilities. A map of the analysis areas and a detailed description of the FORPLAN prescriptions selected in the preferred alternative can be found in the Forest Plan. A discussion of the procedure used to develop and analyze FORPLAN prescriptions is in Appendix B of this document. All FORPLAN prescriptions developed are documented in planning records.

FORPLAN was used to sort through all the prescriptions for each analysis area to identify the set of practices that should be applied to each analysis area to meet the intent of an alternative in a cost efficient manner. This sorting was done for each benchmark and each alternative. An alternative then, is composed of a specific set of practices (a FORPLAN prescription) selected for each of the 109 specific areas (analysis areas). In essence, a Plan alternative is the sum of 109 mini-plans, one mini-plan for each analysis area. Each mini-plan chosen for an alternative is selected because it is the most cost efficient set of practices designed for that area that achieves the intent of the Plan alternative. This procedure was used to create all benchmarks and alternatives, to analyze economic efficiency effects, and to tabulate outputs and environmental effects for each alternative as displayed in this chapter and Chapter IV.

Each FORPLAN prescription is composed of a coordinated set of practices designed to produce a specific mix of outputs and effects on a specific analysis area. To aid display of the general intent of each FORPLAN prescription and to aid display of the standards and guidelines under which practices will be applied, each analysis area was subdivided into Management Areas. Direction for each Management Area consists of a summary statement of management intent and a set of standards and guidlines which control how activities included in the FORPLAN prescriptions will be carried out.

Direction for the different Management Areas are included in Chapter III of the Forest Plan. Management Areas used in analysis but not included in the proposed action are in Appendix G. Plan alternative maps included in this document show Management Area locations.

The FORPLAN prescriptions and direction for Management Areas were used in concert to estimate outputs and effects of implementation of each alternative. The activities listed in the FORPLAN prescriptions cannot be used to predict outputs and effects without knowing what standards and guidelines the activities are carried out under (these standards and guidelines are found in the Management Area Direction section of Chapter III of the Plan). Likewise, just knowing the standards and guidelines will not permit prediction of outputs and effects unless activities are selected and scheduled (activities selected and scheduled are found in the FORPLAN prescriptions).

Complete listings of all FORPLAN prescriptions for all analysis areas are contained in the planning records. These listings contain a description of management intent and all practices, outputs, and effects for each planning period on each analysis area for each alternative. A summary of the FORPLAN prescription selected for application to each analysis area for the preferred alternative is included in Appendix J of the Plan.

Technical feasibility and spatial feasibility of practices were considered in development of FORPLAN prescriptions. All FORPLAN prescriptions, and hence all benchmarks and alternatives comply with minimum management requirements as specified in Forest Planning regulations (36 CFR 219.27). These requirements are listed as Forest Direction in Chapter III of the Forest Plan. Appendix B, Description of the Analysis Process, contains detailed discussion of FORPLAN prescriptions, their development, and their use in the analysis process.

Existing laws, regulations, and Forest Service policies and Regional directives have established criteria for the formulation of alternatives. These criteria fall into three catagories: regulatory, economic, and procedural.

REGULATORY CRITERIA

National Environmental Policy Act (NEPA) regulations (40 CFR 1502.14) require rigorous exploration and objective evaluation of all reasonable alternatives including a "no action" alternative. Alternatives not within the jurisdiction of the agency may be considered. The NEPA regulations also require identification and discussion of all alternatives considered and eliminated from detailed study.

The NFMA regulations (36 CFR 219.12 (f)(1)-(8)) establish criteria for guiding the development of alternatives. The criteria are:

- Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect to the extent practicable the full range of major commodity and environmental resource uses and values that could be produced from the Forest. Alternatives shall reflect a full range of resource outputs and expenditure levels.
- Alternatives shall be formulated to facilitate analysis of opportunity costs.

- Alternatives shall be formulated to facilitate evaluation of effects on present net value, benefits, and costs of achieving various outputs and effects, including outputs that are not assigned monetary values.

- Alternatives shall provide different ways to address and respond to the major public issues, management concerns and resource opportunities identified during the planning process.

- Reasonable alternatives which may require a change in existing law or policy to implement shall be formulated if necessary to address a major public issue, management concern, or resource opportunity identified during the planning process (40 CFR 1501.7, 1502.14[c]).

- At least one alternative shall be developed which responds to and incorporates the RPA Program tentative resource objectives for each Forest displayed in the Regional Guide.

- At least one alternative shall reflect the current level of goods and services provided by the Forest and the most likely amount of goods and services expected to be provided in the future if current management direction continues. Pursuant to NEPA procedures, this alternative shall be deemed the no-action alternative.

- Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative.

The NFMA regulations (36 CFR 219.12(f)(9)) also require that each alternative state:

- The condition and uses that will result from long-term application of the alternative.

- The goods and services to be produced, the timing and flow of these resource outputs, together with associated costs and benefits.

- Resource management standards and guidelines.

- The purposes of the management direction proposed.

Under the NFMA regulations, development of alternatives is based on applying management prescriptions to specific areas of a forest. The regulations define management prescriptions as a set of practices selected and scheduled to attain multiple-use goals and other goals and objectives (36 CFR 219.3). FORPLAN prescriptions, as discussed earlier, meet this definition and purpose. NFMA requires that the management prescriptions used in analysis and in the Forest Plan represent the most cost efficient set of practices necessary for achieving desired objectives. The FORPLAN prescriptions which meet desired objectives in the most cost efficient manner are the ones included in formulation and analysis of alternatives (see discussion in ECONOMIC CRITERIA and Appendix B).

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Federal agencies are required to include and discuss appropriate measures to mitigate adverse environmental impacts (40 CFR 1502.14 and 1502.16)

Mitigation includes:

- Eliminating the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments. (40 CFR 1508.20)

Necessary mitigation measures were incorporated into FORPLAN prescriptions and in the estimates of costs, outputs and effects of each of these prescriptions. Chapter III of the Forest Plan contains management requirements necessary to achieve goals and objectives. Management requirements are presented in two sections. The first section contains Forest Direction which details management requirements that must be maintained and are generally applicable Forest-wide. The second section presents direction for individual Management Areas.

ECONOMIC CRITERIA

The NFMA regulations require that each alternative address projected demand, supply capabilities and local economic impacts. Projected demand was incorporated in formulation of alternatives to ensure that output levels produced in any alternative would be valued only up to the consumptive demand levels. Excess quantities of some outputs would be produced in some situations due to joint production functions, but these excesses were not valued in the cost-efficiency analysis of alternatives. From a supply standpoint, each alternative was formulated to supply a mix of outputs to address issues, concerns, and opportunities.

A requirement for formultating alternatives was that each alternative represent the most cost-efficient way of accomplishing its goals and objectives. Management practices included in each FORPLAN prescription were selected by an interdisciplinary team of resource specialists and approved by District Rangers. Those practices that would accomplish the stated objectives of the prescription were considered, and when more than one practice was available, the most cost-efficient practice was selected. Often there was more than one set of practices that could accomplish a specific set of objectives. A reasonable set of such prescriptions was designed and analyzed. Only those prescriptions that produced desired objectives in a cost efficient manner were used in formulation of benchmarks and alternatives. Appendix B presents a more detailed discussion of economic anaylsis.

As stated, cost efficiency was used to select FORPLAN prescriptions to be used in formulation of benchmarks and alternatives. Cost efficiency was again used in selecting the mix of FORPLAN prescriptions to be applied in particular benchmarks and alternatives. This selection was accomplished using the FORPLAN model to maximize present net value given the intent of an alternative. If two prescriptions were both able to satisfy desired objectives, FORPLAN would select the more cost-efficient prescription.

FORPLAN prescriptions were modeled in a manner which accounted for all major costs and benefits. Output values used in this analysis are shown in Table II-1.

PROCEDURAL CRITERIA

Formulation of alternatives was based on Planning Actions I through IV of the NFMA planning process. The following summarizes how Planning Actions I through IV were used in formulation of alternatives (greater detail is presented in Appendix B).

- Public issues were identified through public involvement efforts. Management concerns were identified and added to the public issues.

- The public issues and management concerns were combined into a set of planning problem statements to be addressed in the Forest Plan. Management Goals or Forest conditions were identified that would address each planning problem.

- Analysis areas were defined and specific characteristics related to the achievement of goals on those areas were inventoried.

- Practices necessary to achieve and maintain desired forest conditions on each analysis area were identified and grouped into FORPLAN prescriptions. Because the prescriptions are designed to achieve goals, they address planning problems. Each prescription responds to planning problems in a different way and each favorably addresses a different set of issues and concerns.

- Benchmarks were used to identify the highest and lowest level of outputs for each resource.

- Alternatives that favorably address issues and concerns were formulated within the decision space defined by benchmarks. This was accomplished by setting specific resource output levels and priorities for achieving them for each alternative.

- FORPLAN was used to select the practices to be applied to each analysis area to achieve the output levels and priorities of each alternative and to tabulate the economic and environmental effects of that selection.

TABLE II-1

Resource Output Values Used in Present Net Value Analysis
(Base Year 1982 1st Quarter)

Source	Resource Element	Output Units	Value
	Water		
RPA	Water Yield	ACRE-FT	$ 45.50
	Range		
RPA/ERS	Cattle Grazing	AUM	$ 9.09
SNF	Sheep Grazing	AUM	$ 1.82
	Recreation		
RPA	Primitive Nonwilderness	RVD	$ 10.31
RPA	Semiprimitive Nonmotorized Nonwilderness	RVD	$ 13.84
RPA	Semiprimitive Motorized	RVD	$ 12.69
RPA	Roaded Natural	RVD	$ 9.97
RPA	Rural	RVD	$ 9.19
RPA	Pristine Wilderness	RVD	$ 12.50
RPA	Primitive Wilderness	RVD	$ 12.50
RPA	Semiprimitive Wilderness	RVD	$ 12.50
SNF1	Developed Public	RVD	$ 9.97
SNF1	Developed Private	RVD	$ 9.97
RPA	Big Game Hunting	WUD	$ 41.00
RPA	Small Game Hunting	WUD	$ 16.00
RPA	Upland Birds Hunting	WUD	$ 24.00
RPA	Waterfowl Hunting	WUD	$ 18.00
RPA	Cold Water Fishing	FUD	$ 11.00
RPA	Nongame Use	WFUD	$ 25.00
SNF	Outfitter Guide Camps	CAMPS	$200.00
	Timber		
R2	Englemann Spruce Sawtimber	MCF	$222.21
R2/SNF	Douglas Fir Sawtimber	MCF	$222.21
R2	Lodgepole Pine Sawtimber	MCF	$266.63
SNF	Pole Timber and Fuelwood	MCF	$ 19.00

RPA	Resource Planning Act, 1985 Assessment
R2	USDA Forest Service Region 2
RVD	Recreation Visitor Day
AUM	Animal Unit Month
WUD	Wildlife User Day
FUD	Fish User Day
WFUD	WUD + FUD
SNF	Shoshone National Forest
SNF1	Same as Roaded Natural
MCF	Thousand Cubic Feet
ERS	Economic Research Service, USDA

BENCHMARK LEVELS

Benchmarks were designed to define the range of feasible choices for alternatives considered in the planning process. Benchmarks could be implemented if all of the assumptions of each were met (See Appendix B). Tables II-2 and II-3 display a summary of benchmark resource output levels and selected economic data.

MINIMUM LEVEL (BENCHMARK #1)

This benchmark represents the minimum level of management needed to maintain this Forest as part of the National Forest System. Costs are those associated with such management and focus on protecting the Forest from trespass and theft of materials and protecting incidental users and neighboring land owners. Outputs are those over which management has little or no control. They include incidental recreation use, wildlife habitat, and natural water production. Minimum level is a management strategy that would meet only the following statutory requirements: administration of unavoidable, nondiscretionary land uses; prevention of impairment of the productivity of the land; and protection of the lives, health, and safety of incidental users. The sum of the costs of these activities defines the long-term fixed costs of public ownership.

This benchmark provided a base for comparing incremental costs and benefits of those alternatives considered in detail. This ensured that economic parameters used in evaluating alternatives were the result of a true incremental analysis in which fixed benefits and costs were not a factor.

CURRENT LEVEL (BENCHMARK #2)

This benchmark was designed to facilitate development of the required no-action alternative (Alternative A). It specified the management actions most likely to be implemented and the outputs most likely to be realized if current direction were followed.

Creation of this benchmark was done using an objective of maximizing PNV using both market and RPA assigned benefit values for outputs. Non-declining flow, which is current policy, was included as a requirement and only those FORPLAN prescriptions representing current direction were considered. Timber outputs for the first decade were required to be at least 80 percent of the average annual output specified in the 1976 timber management plan.

MAXIMUM PRESENT NET VALUE - MARKET OUTPUTS VALUED (BENCHMARK #3)

This benchmark was designed to maximize the present net value of only those goods and services with potential for monetary return to the U.S. Treasury. On this Forest, those goods and services include timber, livestock grazing and developed recreation. Values for all of these outputs were based on 1985 RPA values. Grazing values were the same as RPA values and were based on a study by the Economic Research Service.

Creation of this benchmark was done using an objective of maximizing PNV using only benefit values for market products. No minimum amount of timber, recreation or AUM production was set. Timber flows were controlled so that they could not increase by more than 15 percent nor decrease by more than 10 percent by decade. For the remainder of the benchmark discussions, these flow requirements will be referred to as standard. So that benchmarks could be easily compared, most have the same flow requirements of +15 percent and -10 percent.

MAXIMUM PRESENT NET VALUE - MARKET AND NON-MARKET OUTPUTS VALUED (BENCHMARK #4)

Benchmark #4 was used as a standard to compare the present net values of all alternatives considered in detail. This evaluation is shown in Table II-9 through II-12. Differences in present net values between Benchmark #4 and alternatives considered in detail reflect the monetary opportunity costs associated with those alternatives' emphasis, goals and objectives.

Creation of this benchmark was done using an objective of maximizing PNV using market and assigned benefit values for all outputs. The standard timber flow requirement was used (see Benchmark #3).

MAXIMUM TIMBER LEVEL (BENCHMARK #5)

This benchmark was designed to maximize the production of timber, subject to laws and regulations and without impairing the productivity of the land. A single resource emphasis was used to determine the actual biological potential of the Forest to produce timber. The resulting schedule of timber flows over time would be the most that could be produced in the first five planning periods subject to a maximum 25 percent variation in timber flow per planning period.

The maximum output level in timber was calculated to be an average of 15.6 million board feet of saw timber and 1.3 million board feet of roundwood per year in the first planning period compared with a minimum level of zero. The standard timber flow requirement was used (see Benchmark #3).

MAXIMUM RANGE LEVEL (BENCHMARK #6)

This benchmark is derived from management direction which would maximize production of livestock (cattle and sheep) forage subject to laws and regulations and without impairing the productivity of the land. This single resource emphasis is used to determine the actual biological potential of the Forest to produce livestock forage. The resulting schedule of forage levels over time is the maximum total amount that could be produced over the first five decades. All land area classified as capable, suitable, and available for livestock production was included in this analysis.

The maximum average annual resource capacity in thousands of AUM's that could be achieved from this benchmark in the fifth decade defines the upper bound for all alternatives considered in detail. This amount is used in conjunction with an objective of maximizing PNV using both market and assigned values. The standard timber flow requirement was also used (see Benchmark #3).

OPTIMUM RECREATION (BENCHMARK #7)

This benchmark was designed to satisfy dispersed and developed recreation demand both inside and outside wilderness, subject to laws and regulations and without impairing the long-term productivity of the land.

The maximum average annual expected use, in thousands of RVD's of developed and dispersed recreation, defines the upper bound for all alternatives considered in detail. This amount is used in terms of expected demand by Recreation Opportunity Spectrum Class (ROS). The objective of the benchmark was to maximize PNV using market and assigned values. The standard timber flow requirement was also included (see Benchmark #3).

MAXIMUM WILDLIFE HABITAT LEVEL (BENCHMARK #8)

This benchmark level is derived from management direction which would maximize the capacity of the Forest to provide an optimum mix of wildlife species and diversity, subject to laws and regulations and without impairing the long-term productivity of the land. This resulted in a schedule of wildlife habitat improvement over time that is the maximum amount that could be accomplished over the first five decades.

All lands classified as winter range were included in the analysis. Average annual treatment of winter range would increase by 316 acres over the next five decades. Because of habitat improvement, the number of deer and elk wintering on the Forest would have potential to increase above current levels by about 23 percent by 2030.

All grizzly bear Situation I areas had prescriptions available that would meet the "Grizzly Bear Guidelines". Other prescriptions were designed to enhance grizzly habitat beyond that listed in the guidelines.

Under this benchmark, the maximum average annual resource output of 1,210 acres of winter range would be treated. This level of treatment defines the upper bound for all alternatives considered in detail. This quantity as used along with an objective of maximizing PNV using market and assigned values to identify the most cost efficient way to produce the maximum amount of forage. The standard timber flow requirement was also used (see Benchmark #3).

MAXIMUM WATER YIELD LEVEL (BENCHMARK #9)

This benchmark is derived from management direction which would maximize the capacity of the Forest to produce water, subject to laws and regulations and without impairing the productivity of the land. The resulting schedule of water yield is the maximum amount that could be produced in the next five decades without unacceptable degradation of water quality. Timber harvest, other vegetation treatment and structural snowpack management would all be used with the primary objective of increasing water yield and improving the timing of flows.

The maximum water yield increase (capacity) is 9.4 thousand acre-feet per year, as compared to a current yield increase of 3.6 thousand acre-feet.

The two objectives were to maximize water production and then maximize PNV using market and assigned values. The standard timber flow requirement was also used (see Benchmark #3).

MAXIMUM GRIZZLY BEAR HABITAT LEVEL (BENCHMARK #10)

This benchmark is derived from management direction which would maximize grizzly bear habitat, subject to laws and regulations and without impairing the productivity of the land.

The Forest has a significant amount of habitat for grizzly bears, currently a threatened species in the greater Yellowstone ecosystem. This benchmark was created to investigate the Forest's maximum capability to aid in the recovery of this species and provide for a recovered population at an accelerated rate. This benchmark also provides information for assessing the opportunity costs of grizzly bear management.

The objective of this benchmark was to maximize PNV using market and assigned benefit values with the standard timber flow requirement (see Benchmark #3) and to choose FORPLAN prescriptions designed to enhance bear habitat beyond the requirements of the Grizzly Bear Guidelines for the greater Yellowstone ecosystem.

MAXIMUM TIMBER NONDECLINING FLOW (BENCHMARK #11)

This benchmark is identical to benchmark #5, except that harvest level cannot decrease from decade to decade. As part of analysis of the non-declining flow policy, this benchmark was needed for comparison with the maximum timber using the standard flow requirements (Benchmark #5) and the maximum timber benchmark without flow requirements (Benchmark #12). The results of all three runs provide information as to the need for a departure alternative on the Forest to deal with its skewed age distribution and insect and disease problems (see Appendix B).

Two objectives were used to create this benchmark: maximize timber for the first five decades and maximize PNV using market and assigned benefit values while producing that timber output.

MAXIMUM TIMBER UNCONSTRAINED (BENCHMARK #12)

This benchmark is identical to benchmark #5, except that the harvest level can increase or decrease in unlimited amounts from decade to decade. This benchmark examines the maximum potential and long term effects of producing timber over the first five decades.

The objectives for this run are to maximize timber for the first five decades and maximize PNV using market and assigned benefit values.

MAXIMUM PRESENT NET VALUE - MARKET AND NON-MARKET OUTPUTS VALUED, NONDECLINING TIMBER FLOW (BENCHMARK #13)

This benchmark is identical to benchmark #4, except that timber harvest level cannot decrease from decade to decade and there is no minimum harvest level. The benchmark was created to investigate the best the Forest can do under current policies to maximize economic efficiency. Results of this can also aid determination of the opportunity cost of non-declining flow when compared with the results of the MAX PNV benchmark that used the standard timber flow requirements.

The objective used to create this benchmark was to maximize PNV using market and assigned benefit values while maintaining a nondeclining flow of timber.

MAXIMUM PRESENT NET VALUE - DISTRICT RANGERS' CHOICE (BENCHMARK #14)

As prescriptions were developed, Rangers identified the FORPLAN prescriptions that appeared to solve the most management problems on each analysis area. This benchmark was designed to determine the forestwide effects of these FORPLAN prescriptions.

The objective of this benchmark was to maximize PNV using market and assigned benefit values. Standard timber flow requirements were used (see Benchmark #3).

MAXIMUM PRESENT NET VALUE WITH A 25 PERCENT REDUCED BUDGET (BENCHMARK #15)

This benchmark is necessary to provide input for creating the "reduced budget" alternative that is analyzed in detail.

The objective function for this benchmark was to maximize PNV using market and assigned benefit values. The standard timber flow requirement was used (see Benchmark #3) along with a budget representing a 25 percent reduction from the 1982 Forest actual budget.

MAXIMUM AMENITY VALUES (BENCHMARK #16)

From social analysis, it appeared that many of the local publics favored managing the Forest to maximize amenity values. This benchmark was designed to investigate the effects of such a management strategy.

The objective for this benchmark was to maximize PNV using market and assigned benefit values. Only those prescriptions which significantly improved wildlife habitat and/or enhanced water quality were considered. The standard timber flow requirement was used (see Benchmark #3).

MAXIMUM FORAGE PRODUCTION FOR CATTLE (BENCHMARK #17)

Some allotments on the Forest can produce either cattle or sheep. In the face of declining demands for sheep, a benchmark that would identify the maximum amount of forage for cattle only was judged to be necessary.

Two objectives were used: first, cattle forage for the first 5 decades was maximized; then, assuming this level of forage production, PNV using market and assigned values was maximized. The standard timber flow requirement was also used(see Benchmark #3).

MAXIMUM WILDERNESS (BENCHMARK #18)

This benchmark was developed to evaluate the effects of designating all RARE II areas as wilderness. It was developed prior to the passage of the Wyoming Wilderness Act of 1984.

Creation of this benchmark was done using an objective function of maximizing PNV using market and assigned benefit values for all outputs. The standard timber flow requirement was used (see Benchmark #3).

TABLE II-2

Benchmark Output Summary

Item	Units[10]	Benchmark Number and Name 1 Minimum Level	2 Current	3 PNV Market Only	4 PNV Market + Assigned	5 Timber	6 Range	7 Recreation	8 Wildlife	9 Water
Dispersed Wilderness	MRVD[1]	5.74	202.	145.	145.	153.	171.	224.	209.	96.5
Dispersed Nonmotorized	MRVD[1]	15.6	52.5	50.3	50.3	55.3	44.5	50.1	63.6	65.3
Dispersed Motorized	MRVD[1]	3.5	1030.	974.	974.	485.	1202.	1114.	551.	1168.
Developed Public	MRVD[1]	--	271.	253.	250.	264.	250.	287.	256.	269.
Developed Private	MRVD[1]	--	151.	150.	150.	55.2	81.6	136.	150.	53.9
Wildlife Use	MWUD[1,2]	13.8	197.	187.	188.	194.	185.	216.	183.	161.
Fish Use	MFUD[1]	5.72	94.3	94.5	94.5	97.1	96.0	104.	92.5	84.3
Sage Mgt Wildlife	AC[3]	--	4290.	4360.	4360.	3640.	4700.	5750.	7420.	7310.
Aspen Mgt Wildlfe	AC[3]	--	4650.	3550.	3550.	3330.	3800.	4700.	4680.	6440.
Wildlife Forage	MCAUM[1,4]	134.	38.7	45.9	44.8	44.8	33.5	65.0	134.	91.2
Cattle Forage	MCAUM[1]	--	78.4	71.0	71.0	70.7	83.1	50.3	--	44.5
Sheep Forage	MSAUM[1,5]	--	39.2	38.8	38.8	40.0	43.0	36.4	--	13.7
Timber North	MMBF[1,6]	--	4.8	4.1	4.1	6.7	4.2	4.6	3.8	4.9
Timber South	MMBF[1,6]	--	7.4	7.4	7.4	10.2	7.5	6.2	5.7	8.9
Timber Suitable	MAC	--	116.	104.	104.	122.	113.	97.0	81.3	131.2
Water Increase	MAF[7]	--	4.94	4.50	4.46	7.45	4.94	4.59	4.43	9.40
Enhanced Summer Runoff	AF[7]	--	--	--	--	--	--	--	21.	2680.
Large Group Camps	CAMPS[8]	--	310.	243.	243.	268.	281.	287.	218.	231.
Budget	MM$[1,9]	.372	4.7	3.73	3.76	4.55	4.25	4.27	3.36	4.51
Discounted Costs[11]	MM$[9]	8.9	107.	83.	84.	103.	96.	96.	74.	102.
Discounted Benefits[11]	MM$[9]	4089.	260.	-2802.[12]	445.	457.	449.	443.	350.	-140.
Present Net Value[11]	MM$[9]	4080.	153.	-2885.[12]	361.	354.	353.	347.	276.	-242.
Benefit/Cost Ratio[11]	NA	459.	2.4	-34.[12]	5.3	4.4	4.7	4.6	4.7	-3.4

1 per year for the first decade
2 half are consumptive, half are noncomsumptive
3 figure shown is total acres under periodic treatment, not acres treated first decade
4 in Cattle AUMS (2 Elk AUM = 1 Cattle AUM)
5 Sheep AUMS (1 Sheep AUM = 1/5 of a Cattle AUM)
6 using regional average conversion of 4.45 MBF/MCF, Sawtimber plus poletimber
7 average per year for first 50 years
8 allocation of large group camps to public versus private not established here
9 1982 dollars
10 MRVD=thousand recreation visitor days, MWUD=thousand wildlife user days, MFUD=thousand fish user days, AC=acres, MCAUM=thousand cattle animal unit months, MSAUM=thousand sheep unit months, MMBF=million board feet, MAC=thousand acres, MAF=thousand acre-feet, AF=acre-feet, MM$=million dollars
11 values for all benchmarks except Benchmark 1 are incremental from Benchmark 1.
12 does not include assigned values.

TABLE II-2 (Continued)

Benchmark Output Summary

Item	Units[10]	Benchmark Number and Name 10 Grizzly Enhancement	11 Timber Non-decline	12 Timber Unconstrained	13 Market+ Assigned Nndeclin	14 District Needs Only	15 Budget Market+ Assigned	16 Amenity	17 Cattle	18 Maximum Wilderness
Dispersed Wilderness	MRVD[1]	156.	153.	178.	146.	176.	106.	189.	169.	265.
Dispersed Nonmotorized	MRVD[1]	45.5	60.6	61.4	50.1	46.1	45.7	55.	45.1	8.31
Dispersed Motorized	MRVD[1]	958.	1201.	1240.	974.	1003.	826.	1019.	1083.	790.
Developed Public	MRVD[1]	259.	264.	264.	253.	286.	171.	238.	250.	251.
Developed Private	MRVD[1]	113.	55.2	55.2	150.	151.	92.4	148.	81.6	150.
Wildlife Use	MWUD[1]	198.	194.	194.	188.	192.	140.	184.	92.4	184.
Fish Use	MFUD[1]	97.9	97.3	97.9	94.5	89.0	68.6	94.1	96.9	94.0
Sage Mgt Wildlife	AC[3]	5230.	3420.	3850.	4360.	6510.	2950.	5520.	4570.	6010.
Aspen Mgt Wildlife	AC[3]	5040.	3320.	3550.	3550.	5370.	3040.	3124.	3750.	4190.
Wildlife Forage	MCAUM[1,4]	54.8	45.8	47.8	46.2	46.7	83.8	117.6	38.2	71.0
Cattle Forage	MCAUM[1]	59.1	70.5	68.1	70.6	77.3	41.6	19.7	88.3	65.9
Sheep Forage	MSAUM[1,5]	39.2	39.0	39.0	36.8	31.2	24.0	11.4	31.8	36.2
Timber North	MMBF[1,6]	3.0	6.4	11.1	3.6	4.8	--	2.3	4.2	3.6
Timber South	MMBF[1,6]	7.4	8.4	15.1	7.1	7.3	--	6.1	7.5	6.3
Timber Suitable	MAC	99.2	136.	130.	80.5	116.	--	74.5	114.	77.5
Water Increase	MAF[7]	4.53	6.55	7.70	4.04	5.2	1.50	3.97	4.88	4.43
Enhanced Summer Runoff	AF[7]	--	--	--	--	--	--	--	--	--
Large Group Camps	CAMPS[8]	241.	268.	268.	243.	309.	169.	222.	275.	285.
Budget	MM$[1,9]	3.99	4.47	4.81	3.70	4.60	2.43	3.49	4.19	4.24
Discounted Costs[11]	MM$[9]	89.	101.	109.	82.	104.	52.	77.	94.	91.
Discounted Benefits[11]	MM$[9]	434.	461.	454.	436.	464.	181.	-199.	443.	-189.
Present Net Value[11]	MM$[9]	345.	360.	345.	354.	360.	129.	-276.	349.	-280.
Benefit/Cost Ratio[11]	NA	4.9	4.6	4.2	5.3	4.5	3.5	-2.6	4.7	-2.1

[1] per year for the first decade
[2] half are consumptive, half are noncomsumptive
[3] figure shown is total acres under periodic treatment, not acres treated first decade
[4] in Cattle AUMS (2 Elk AUM = 1 Cattle AUM)
[5] Sheep AUMS (1 Sheep AUM = 1/5 of a Cattle AUM)
[6] using regional average conversion of 4.45 MBF/MCF, Sawtimber plus poletimber
[7] average per year for first 50 years
[8] allocation of large group camps to public versus private not established here
[9] 1982 dollars
[10] MRVD=thousand recreation visitor days, MWUD=thousand wildlife user days, MFUD=thousand fish user days, AC=acres, MCAUM=thousand cattle animal unit months, MSAUM=thousand sheep unit months, MMBF=million board feet, MAC=thousand acres, MAF=thousand acre-feet, AF=acre-feet, MM$=million dollars
[11] values for all benchmarks except Benchmark 1 are incremental from Benchmark 1.

TABLE II-3

Possible Range of Outputs from Benchmarks

Item	Units[10]	Minimum Considering Benchmark #1	Minimum Excluding Benchmark #1	Maximum Excluding Benchmark #1	Maximum Considering Benchmark #1
Dispersed Wilderness	MRVD[1]	5.74	96.5	265.	265.
Dispersed Nonmotorized	MRVD[1]	8.31	8.31	65.3	65.3
Dispersed Motorized	MRVD[1]	3.5	485.	1240	1240.
Developed Public	MRVD[1]	-	171.	287.	287.
Developed Private	MRVD[1]	-	55.2	151.	151.
Wildlife Use	MWUD[1,2]	13.8	92.4	216.	216.
Fish Use	MFUD[1]	5.72	68.6	97.1	97.1
Sage Mgt Wildlife	AC[3]	-	2950.	7420	7420.
Aspen Mgt Wildlfe	AC[3]	-	3040.	6440	6440.
Wildlife Forage	MCAUM[1,4]	13.7	13.7	134.	134.
Cattle Forage	MCAUM[1]	-	0	88.3	88.3
Sheep Forage	MSAUM[1,5]	-	0	43.0	43.0
Timber North	MMBF[1,6]	-	0	11.1	11.1
Timber South	MMBF[1,6]	-	0	15.1	15.1
Timber Suitable	MAC	-	0	136.	136.
Water Increase	MAF[7]	-	1.5	9.4	9.4
Enhanced Summer Runoff	AF[7]	-	0	2680	2680.
Large Group Camps	CAMPS[8]	-	169.	310.	310.
Budget	MM$[1,9]	.372	2.15	4.7	4.7
Discounted Costs[11]	MM$[9]	8.9	52.	109.	109.
Discounted Benefits[11]	MM$[9]	-2802.[12]	-2802.[12]	464.	NA
Present Net Value[11]	MM$[9]	-2885.[12]	-2885.[12]	361.	NA
Benefit/Cost Ratio[11]	NA	-34.[12]	-34.[12]	5.3	NA

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[1] per year for the first decade

[2] half are consumptive, half are noncomsumptive

[3] figure shown is total acres under periodic treatment, not acres treated first decade.

[4] in Cattle AUMS (2 Elk AUM = 1 Cattle AUM)

[5] Sheep AUMS (1 Sheep AUM = 1/5 of a Cattle AUM)

[6] using regional average conversion of 4.45 MBF/MCF, Sawtimber plus poletimber

[7] average per year for first 50 years

[8] allocation of large group camps to public versus private not established here

[9] 1982 dollars

[10] MRVD [illegible]usand recreation visitor days, MWUD=thousand wildlife user days, MFUD=thousand fish user days[illegible]=acres, MCAUM=thousand cattle animal unit months, MSAUM=thousand sheep unit months, MMBF=million board feet, MAC=thousand acres, MAF=thousand acre-feet, AF=acre-feet, MM$=million dollars

[11] values are incremental from Benchmark 1.

[12] does not include assigned values.

ALTERNATIVES CONSIDERED AND ELIMINATED FROM DETAILED STUDY

All benchmarks could be considered as alternatives; however, none were analyzed as alternatives considered in detail because each tended to focus on a select issue rather than a majority of the issues. Features of the various benchmarks that fulfill legal requirements or respond to issues and concerns are retained in the alternatives studied in detail.

Three alternatives were considered but eliminated form further study. Elements of each were incorporated into one or more alternatives that are analyzed in detail.

DISTRICT RANGERS' ALTERNATIVE

This alternative was formulated by allowing each District Ranger to choose the FORPLAN prescription he felt was best for managing each analysis area on the District. The choice was independent of any forestwide strategy. Results of this alternative are those reported for benchmark 14. This alternative produced commodity outputs at levels approximately the same as production levels for the last 5 years. It increased the land base suited for timber management by about 23,000 acres (about 25 percent) over the lands currently being managed for timber. It decreased recreation use in all types of recreation with the exception of developed recreation. It did this to disperse recreation use more than has been done in the last 5 to 10 years and thereby increased the quality of recreation experiences in some cases. Also it provides for a high amount of wildlife habitat improvement. During formulation of alternatives, many features of this alternative in such areas as recreation management and wildlife management were found to fit the philosophy of the preferred alternative and were incorporated into that alternative. Many other features of this alternative were the same as those of Alternative A. Because the outputs and effects of this alternative were adaquately displayed in these other alternatives, there was no need to analyze this alternative in detail.

PRELIMINARY NONCOMMODITY ALTERNATIVE

This alternative was created by selecting FORPLAN prescriptions that provide water yield increases, optimize recreation opportunities, emphasize wildlife forage and reduce the risk of watershed impacts. Construction of this alternative was based on benchmark 16. As in benchmark 16, production of commodities was decreased from historic levels, recreation management favored low density recreation opportunities and stringent standards were applied to logging, road construction and oil and gas operations to reduce the risk of impacts on watersheds. Grazing of domestic livestock was decreased to provide more forage for wildlife. Before this alternative was completely formulated, the Sierra Club and Greater Yellowstone Coalition provided input on an alternative they wanted to see analyzed (see discussion below and in Appendix B). Rather than develop two closely related alternatives for detailed study, this alternative was used inconjunction with input from these groups to formulate Alternative C, Noncommodity Emphasis, which is analyzed in detail.

SIERRA CLUB/GREATER YELLOWSTONE COALITION ALTERNATIVE

Acting on a general invitation to the public, a joint representation of these groups came to the Forest to inspect FORPLAN prescriptions and benchmark results. Based on this review, they indicated that they would like to help design an alternative. They chose benchmark 16 (Amenity) as a basis for this alternative. Input from these groups was in the form of modifications of FORPLAN prescriptions selected in this benchmark. Often, these modifications were minor and related to changing the percentages managed for different types of recreation or decreasing grazing of domestic livestock in selected areas to increase forage available for wildife. Their input did not comprise a complete alternative. Further, the intent of their alternative appeared to be the same as the intent of the preliminary noncommodity alternative. Specific FORPLAN prescriptions recommended by these groups were used to merge this alternative with the preliminary noncommodity alternative to create the final noncommodity alternative (Alternative C) examined in detail. See Appendix B for a complete discussion of how features of this alternative were included in Alternative C.

ALTERNATIVES CONSIDERED IN DETAIL

Each alternative described in section meets the requirements of the NFMA regulations. NFMA regulations require alternatives to address public issues and management concerns. To insure this, alternatives were formulated so that each addressed the planning problems identified in the scoping process. Planning problems were derived from public issues and management concerns early in planning (see Planning Action I on file at the Forest Supervisor's Office and Appendix A, Issue, Concern, and Opportunity Identification Process).

FORPLAN prescriptions were integrated and modeled within spacially distinct analysis areas. There are 109 such analysis areas. Each alternative prescribes a mix of activities that would occur within each analysis area. The selection of particular FORPLAN prescriptions within an alternative addresses issues and concerns identified earlier by producing different forest conditions and different levels of goods and services (see Appendix B).

Projected demand was incorporated into the formulation of alternatives by ensuring that output levels produced in any alternative were valued only up to the consumptive trend levels. In some situations, due to joint production functions, excess quantities of some outputs (i.e., outputs above projected demand) are produced, but these excess quantities were not valued in the cost-efficiency analysis of the alternatives.

From a supply standpoint, each alternative was formulated by attempting to recognize how management of the Forest related to production of the same outputs by other governmental and private entities. The need to change direction to correct shortfalls in local or regional supply, as well as maintaining the opportunity to do so were important considerations in the formulation of each alternative.

NFMA regulations require coordination of outdoor recreation, range, timber, water, wildlife, fish and wilderness resources. To achieve such multiple use coordination, each alternative must provide for an integrated mix of activities and resource outputs and effects. Integration was achieved by ensuring that scheduled activities and treatments on each analysis area of the Forest were compatible within a FORPLAN prescription. Integration of all resources in such a prescription is further provided by the basic requirements found in the Forest Direction, Chapter III of the Plan.

Techniques used for achieving a healthy, vigorous, productive and visually attractive Forest are designed into FORPLAN prescriptions, Forest Direction, and Management Area Direction. These techniques include:

- Vegetation treatment to increase diversity for wildlife habitat and visual resources in conifers, aspen, shrublands and grasslands.
- Protection of Wild and Scenic River corridors to achieve visually attractive surroundings.
- Provide visually attractive, informative signs and visitor facilities.
- Locate and design structures to blend with natural surroundings or appear visually pleasing.
- Locate and design roads to lie unobtrusively on the landscape and to serve recreation and silvicultural needs.
- Locate trails to take advantage of vistas and outlooks.
- Close roads and areas where resource standards are not being met to allow rehabilitation.
- Manage wilderness to achieve a spectrum of recreation opportunities.
- Maintain fire dependent ecosystems by the use of prescribed fires.
- Protect riparian and aquatic ecosystems by construction of fences or use of other practices that minimize or prevent disturbance in such areas.
- Provide range improvements and activities to achieve satisfactory range conditions in grassland and shrubland ecosystems.
- Implement vegetation treatments to reduce the incidence of insect and disease outbreaks.
- Manage vegetation and provide structural treatments to enhance the quantity and timing of Forest water yields.
- Implement measures to rehabilitate areas contributing to lowered water quality and loss of soil productivity.
- Monitor all resources to achieve standards provided by Forest Direction in Chapter III of the Plan.

Vegetation treatments and levels differ by alternative. Treatments are used to adjust existing plant communities to best meet vegetation needs and other resource goals and objectives. Similarly, other techniques for achieving the desired Forest condition are scheduled and budgeted at different levels as accounted for by the emphasis of the alternative.

Costs associated with vegetation management and other activities necessary to achieve the goals stated in these alternatives are significant. On the Forest, it is often difficult to justify the expense of vegetation management solely to achieve goals associated with single resource outputs such as maintenance of visual quality, wildlife habitat improvement, insect and disease prevention, water yield improvement or commercial timber harvest. Doing so may maximize the use of some resources, but reduce the total outputs and the long-term potential of other resources. Individually, the costs are often too great and the long-term benefits too small. However, by applying an integrated approach to management which combines the individual costs and benefits, it is possible to design management activities which achieve the overall goals and are cost-efficient. Goals and objectives associated with vegetation management can be achieved by commercial timber harvest. This approach has the added benefit of returning revenue to the treasury and maintaining existing employment in communities dependent on the timber industry. In other cases, the use of prescribed fire, firewood removal, or cutting by Forest Service crews or volunteers, may be the most efficient way to treat vegetation. Combinations of methods applied over time will provide the most desirable results Forestwide.

Often these activities require construction of roads. The use of roads, rather than the roads themselves, cause most of the impacts on other resource uses and activities. Each alternative includes direction for managing the use of existing and future roads. Management activities will include obliteration, total or seasonal closures to motorized use, and controlled motorized use (use for specified purposes).

Each of the six alternatives described in this section was developed and analyzed through the NFMA planning process outlined in Chapter I. The proposed action is Alternative D. The six alternatives were of a range sufficient to address all the issues, concerns and opportunities identified in the planning process (see Chapter I and this chapter under RESPONSES TO ISSUES, CONCERNS AND OPPORTUNITIES). The alternatives considered in detail facilitate the evaluation of opportunity costs (monetary and nonmonetary) of various levels of production of resources and environmental protection.

Associated with each alternative is a prediction of outputs and effects over time. Outputs and effects were estimated for ten decades. Timber harvest was examined for nineteen decades to ensure nondeclining yield of wood fiber production, as required by NFMA 36 CFR 219.16[a][1]. The Plan will provide direction only until it is revised. Revisions will occur at least every 10 to 15 years. Therefore, estimates for outputs and effects for the first 10 to 15 years respresent those that are proposed under any alternative. Beyond that time frame, estimates are provided as input on which to judge the long-term effect of each alternative.

Each alternative includes a set of practices to be applied to each analyis area on the Forest. The practices to be implemented during the next 5 years are referred to as planned actions. Practices for the 5 years following this are proposals. And practices beyond that stretching the full 5 decades are projections of the practices that would be needed for long-term implementation of an alternative. Given that there will be a revision of the Plan every 10 to 15 years, projections of practices are for informational purposes only and do not represent decisions that can not be changed as circumstances change. Each alternative includes a set of standards, guidelines, and mitigating measures to be applied during implementation of the scheduled practices. The outputs and effects of alternatives are estimated assuming standards, guidelines, and mitigating measures are applied. The standards, guidelines, and mitigating measures associated with each alternative are listed in Chapter III of the Forest Plan, Management Direction, and in Appendix G of this EIS, Management Area Direction Used in Formulation of Alternatives But Not Applied in the Proposed Action.

The practices, outputs, and effects are summarized in this chapter under the heading COMPARISON OF ALTERNATIVES and are presented in more detail in Chapter IV, ENVIRONMENTAL CONSEQUENCES. The practices, outputs, and effects for each analysis area in each alternative are included and are available in planning records. Selected practices, outputs, and effects on each analysis area in Alternative D, Preferred, are listed in Appendix J of the Forest Plan.

All alternatives currently reflect the provisions of the Wyoming Wilderness Act of 1984 dealing with the Shoshone National Forest. This Act provides for studying a portion of the High Lakes Area for inclusion in wilderness in the next round of Forest planning. In all alternatives, this study area will be managed to preserve wilderness character as described in the Plan, Chapter III, under direction for Management Area 10E, High Lakes Wilderness Study Area. The Dunoir Special Management Unit is managed in all alternatives to preserve wilderness character according to P.L. 92-476, as described in the Plan, Chapter III, under direction for Management Area 10F, Dunoir Special Management Area.

The Clark's Fork of the Yellowstone River has been recommended and administratively endorsed for inclusion in the Wild and Scenic River System, but Congress has yet to act. Wiggin's Fork of the Wind River was examined for potential as a study river, but was determined to be ineligible for inclusion (see Appendix E).

In all alternatives, most of the Forest outside wilderness is available for mineral leasing under the Mineral Leasing Act of 1920. Specific decisions, particularly with regard to surface occupancy, will be made on a case-by-case basis. Designated wildernesses are withdrawn from mineral leasing and entry except for verified existing rights. An experimental technique was used to estimate the value of leases for all lands available for leasing based on a willingness-to-pay value. This is detailed in Appendix D, Oil and Gas Valuation Procedure.

ALTERNATIVE DESCRIPTIONS

The following alternative descriptions include a statement of the philosophy which guided the formulation of the alternative and highlights the salient features of the alternative. An alternative is composed of a specific FORPLAN prescription for each analysis area on the Forest. The FORPLAN prescriptions chosen depend on the overall emphasis of the alternative. Descriptions of each FORPLAN prescription chosen for implementation on each analysis area in each alternative are readily available in the planning records. The description of alternatives presented here is a Forest-wide perspective. Appendix J of the Forest Plan contains descriptions of the FORPLAN prescriptions designated for implementation on individual analysis areas in the preferred alternative. The planning records contain the same detail as shown in Appendix J for all alternatives.

The analysis process that resulted in the alternatives considered in detail and the associated expected future conditions reported here is described in detail in Appendix B.

Alternative A (Current Direction - No Action)

This alternative is designed to depict the effects of managing the Forest under goals and objectives of existing plans and policies. This provides a basis for comparing all other alternatives. It is also the no-action alternative, as required by NEPA, for it depicts what would happen if no action were taken to change the current management direction on the Forest. This alternative was formulated by creating FORPLAN prescriptions for each analysis area that portray implementation of current plans and policies and requiring FORPLAN to select these during analysis.

Distribution of recreation opportunities and types of recreation opportunites available would remain the same as is currently available. No new developed or dispersed recreation facilities would be constructed. Range management would be guided by existing allotment plans and all range currently available to domestic livestock would remain available. Timber harvest would be done as it has been over the last 5 to 10 years with standards allowing for the legal maximum in terms of cut block size and distribution. The suited land base would drop about 3 percent from the 1976 Timber Management Plan; however, the allowable sale quantity would increase by about 10 percent above that indicated in the 1976 Timber Management Plan. Road construction and reconstruction would stay about the same as over the last 10 years with the same proportion of roads closed, open and controlled through seasonal closures through the first decade. Wildlife habitat improvements would continue, using treatments specifically designed for wildlife, as would continuation of timber harvests, range management and seasonal road closures to protect and enhance habitat. Oil and gas leasing and operations would be allowed under stipulations and with operating standards selected to insure that minimum legal standards for surface resources are met.

Currently there are controversies surrounding oil and gas leasing and development, timber harvests, road construction, and wildlife management. By continuing management direction and policies which caused these controversies, there is little expectation that issues would be resolved. This alternative would continue with current production levels and mixes of goods and services, thereby providing stability for those whose livelihoods and lifestyles are based on historic patterns of management on the Forest. In this way, it would respond to issues and concerns regarding maintenance of the status quo, including continued support of local recreation, ranching, and timber-based sectors of the economy.

By continuing coordination efforts such as helping to develop and implement the policies of such groups as the Greater Yellowstone Coordination Committee and the Interagency Grizzly Bear Committee, as well as coordination efforts with the Wyoming Game and Fish Department, this alternative would contribute to the maintenance of those portions of the greater Yellowstone area which are under the Forest's control. This coordination effort is a part of all alternatives.

Expected Future Condition

Over time, about 3.5 percent of the Forest would be managed for timber. This minor portion of the Forest would be composed of a mosaic of even and all-age stands. The even-age stands would be of varying age classes and timber sizes, found in 40 acre blocks. Boundaries of some of these stands, particularly the younger age classes, would be easy to identify on the ground because standards for feathering and blending them with surrounding areas would be minimal. Other timbered areas (about 40 percent of the Forest) would be characterized by old growth stands with dead standing timber and some timber laying on the ground. Throughout this portion of the Forest, there could be large areas (500 to 1000 acres in size) where there is evidence of wildfire, with even-age timber stands growing back. Most areas where there are currently stands of aspen would be maintained and treated through time to counter encroachment by conifers.

Domestic livestock would be found on about 11 percent of the Forest. Ecological condition of these and other range lands would be at or near climax vegetation communities. This would be true except for about 1 percent of the Forest where sagebrush-grassland ecosystems would be managed for a mosaic of sagebrush age classes.

There would be a net increase in the amount of roads on the Forest of about 28 miles during the firest ten years. About 64 percent of the total road miles would be open to the public year round.

All currently existing recreation facilities including trails, would be maintained in a high level of repair. About 55 percent of the areas classified as wilderness would have a well-developed trail system, while 15 percent would have no trails at all.

About 38 percent of the Forest would be available for mineral leasing. There would be some evidences of exploration activities. If a pool of oil and gas is discovered, development would be visually evident due to the minimum standards placed on such operations within this alternative.

Wildlife population targets established in 1985, including a recovered population of grizzly bears, would be met. The only exception to this would be within the North Fork of the Shoshone herd units for bighorn sheep and elk. In these herd units, 40 percent of the 1985 Wyoming Game and Fish Department targets for bighorn sheep and 57 percent of their targets for elk would be met. Timber operations along with planned treatment of sage brush, aspen and willow, would provide a healthy forest condition in early successional stages on about 5.1 percent of the Forest.

Impacts on local economies would be about the same as they are now, and all commercial operations currently dependent on the Forest would be supported.

Alternative B (Commodity Emphasis)

This alternative was formulated to address a set of issues and concerns requesting a high level of production of commodity-oriented goods and services. This includes a high level of timber production, a high level of production of forage for domestic livestock, and high levels of developed recreation opportunities, including lodges and outfitters and guides. Also, to meet the commodity interest, stipulations and probable operating standards for oil and gas were kept at levels to meet legal minimum standards only and thereby provide the least restrictive environment for such operations.

Issues and concerns for which this alternative was designed include providing a maximum upward impact on declining local economies, increasing revenues to the U.S. Treasury, increasing revenues to local economies, and facilitating to the extent possible the exploration and development of domestic reserves of oil and gas.

This alternative was created by setting minimum production requirements for timber and forage for domestic livestock. These levels were at or near the maximum amount possible on the Forest based on benchmark analysis. Also included was a minimum production level for developed recreation that would meet or exceed developed recreation demand on all Ranger Districts. Finally, stipulations and probable operating standards for oil and gas leasing and operations were set to provide only for legal minimum standards on soil, water, air, and threatened and endangered species.

Developed recreation is one emphaisi of this alternative, as are expenditures for developed recreation facility construction. Dispersed nonwilderness recreation would also be higher than that currently available, though expenditures for facilities such as trailheads would decline. This means that there would be a slight shift from nonmotorized recreation toward motorized and developed recreation opportunities. Wilderness recreation management would emphasize primitive recreation opportunities over both pristine and semiprimitive when compared with current opportunities.

Management of range ecosystems would be intensified, with increases in forage available for domestic livestock. Also, this increase in intensity of management of range ecosystems would increase both forage available for wildlife and wildlife habitat improvement.

Acreage of timberland suited for timber management would increase to 106,000 acres or 14 percent higher than in the 1976 timber management plan. This results in the highest planned timber harvest of all alternatives, with an allowable sale quantity of 12.88 MMBF annually for the first decade.

Construction of new roads and reconstruction of existing roads would be less than has occurred over the last 10 years, with more miles of road closed to public access and seasonally closed. This means that public access to the Forest would decline in comparison to access levels provided by existing plans and policies.

This alternative would increase income to Federal, State and local governments. It would increase the amount of commodities produced, thereby providing the maximum upward impact on local economies. It would increase the amount of developed recreation provided, thus increasing the ability of the Forest to provide facilities to those visiting neighboring National Parks during times when Park facilities are filled to capacity. From an energy independence standpoint, this alternative would provide for the least restrictions on oil and gas operations, thereby facilitating such operations to the maximum legal extent. Current oil and gas policies are causing polarization of local communities, as are current timber harvest levels. This alternative would exacerbate such controversies and could have a negative effect locally, regionally and nationally.

Expected Future Condition

Over time, about 4.4 percent of the Forest would be managed for timber. This minor portion of the Forest would be composed of a mosaic of even and all-age stands. The even-age stands would be of varying age classes and timber sizes, found in 40 acre blocks. Boundaries of some of these stands, particularly the younger age classes, would be easy to identify on the ground because standards for feathering and blending them with surrounding areas would be minimal. Other timbered areas (about 39 percent of the Forest) would be characterized by old growth stands with dead standing timber and some timber laying on the ground. Throughout this portion of the Forest, there could be large areas (500 to 1000 acres in size) where there is evidence of wildfire, with even-age timber stands growing back. Most areas where there are currently stands of aspen would be maintained and treated through time to counter encroachment by conifers.

Domestic livestock would be found on about 10.5 percent of the Forest. Ecological condition of these and other range lands would be at or near climax vegetation communities. This would be true except for about one percent of the Forest where sagebrush-grassland ecosystems would be managed for a mosaic of sagebrush age classes. There would be more fences and water developments than exist now because of an intensified range management program.

There would be a net increase in the amount of roads on the Forest of about 18 miles during the first 10 years. During this time about 42 percent of the roads on the Forest would be open year round for public use. Road closures and controlled use of roads on the remainder would provide for less disturbance of wildlfie.

All currently existing recreation facilities including trails, would be maintained in a high level of repair. There would be more developed recreation facilities than exist currently but fewer facilities supporting nonmotorized recreation such as trailheads. There would be about 10 percent of the wilderness area that has no trails. Wilderness areas with well developed trail systems would be about 34 percent of total wilderness area.

About 38 percent of the Forest would be available for mineral leasing. There would be some evidences of exploration activities. If a pool of oil and gas is discovered, development would be visually evident due to the minimum standards placed on such operations within this alternative.

Wildlife population targets established in 1985, including a recovered population of grizzly bears, would be met. The only exception to this would be within the North Fork of the Shoshone herd units for elk. In this herd unit, 60 percent of the 1985 Wyoming Game and Fish Department targets would be met. Timber operations along with planned treatment of sage brush, aspen and willow, would provide a healthy forest condition in early successional stages on about 5.8 percent of the Forest.

Impacts on local economies would be relatively large in terms of supporting those economies and tax revenues generated.

Alternative C (Noncommodity Emphasis)

This alternative was formulated to address a set of issues and concerns calling for a limitation on commodity production on the Forest. Such comments requested less timber harvest (from none to about 8 MMBF per year), less grazing of domestic livestock, and a curtailment of oil and gas leasing and operations on the Forest.

Issues and concerns for which this alternative was designed include protection of the greater Yellowstone ecosystem, and protection of visual quality, high quality recreation experiences, soil productivity, water quality, wetlands and wildlife including threatened and endangered species.

This alternative was formulated using input provided by representatives of the Sierra Club and Greater Yellowstone Coalition. Management strategies selected in the amenity benchmark were modified and formed the basis of those strategies chosen for this alternative. Preliminary analysis of this alternative provided timber production at a level which maximized economic efficiency. This level was higher than that which would meet the intent of this alternative, so an upper limit on timber production for the first 10 years was set at an annual level of 8.0 MMBF.

This alternative was designed to change the mix of recreation opportunities currently provided. The mix of nonwilderness recreation moves away from motorized and developed recreation and emphasizes nonmotorized recreation. This affects the ability of the Forest to provide for overflow camping in times when neighboring National Parks are filled to capacity, but addresses issues and concerns calling for more nonmotorized recreation opportunities away from the sights and sounds of man.

Areas managed for timber are decreased from that under the 1976 timber management plan to 71,000 acres, a 24 percent decrease. Timber harvest would decrease to about 8.0 MMBF for the first 10 years, a decrease of 24 percent.

Areas managed for grazing of domestic livestock are decreased whencompared with the area currently grazed. This would result in about a 30 percent reduction in forage available for domestic livestock. Also there would be a 70 percent increase in forage available for wildlife.

This alternative places stringent stipulations and probable operating standards on oil and gas leasing and operations to the point that any such operations would have minimal effects on visuals, recreation and wildlife, as well as meeting legal minimum standards for soil, water, air and wildife.

This alternative would also provide less motorized access to the Forest than exists currently.

All of these changes would address the set of issues and concerns for which the alternative was created. However, some in the local area dependent on commodity production from the Forest would be detrimentally effected.

Expected Future Condition

About 2.9 percent of the Forest would be managed for timber. The forest condition on this portion of the Forest would be a mosaic of all age and even-age stands. The even-age stands would be of varying age classes. The edge of each stand would be difficult to discern visually because of standards to blend and feather edges with surrounding stands. Stand size would generally be slightly smaller (5 to 10 acres smaller) than current even-age stands. As in all alternatives, roads built into timberlands for logging purposes would be closed to public use. The remaining 41 percent of the Forest with timber cover would be dominated by old growth stands, with some dead and dying trees evident. There could, also be evidences of fires in 500 acre to 2000 acre blocks throughout the area.

Domestic livestock would be found on only about 8.4 percent of the Forest. The ecological condition of rangelands over time would be good to excellent in terms of climax vegetation. About 50 percent of the sagebrush-grassland areas currently treated would be treated in this alternative. Therefore, in this ecosystem, there would be more areas dominated by sagebrush of higher density and size. This would benefit wildlife requiring such sagebrush, but would be detrimental to other wildlife.

Ther sould be a net increas in the amound of roads on the Forest of about 23 miles during the first 10 years. About 41 percent of the total road system would be open year round for public use. Road closures and controlled use of roads in the remainder would provide for less disturbance of wildlife.

There would be fewer campgrounds and trailheads provided with some exisiting facilities being closed and obliterated. There would be a large increase in areas outside of wilderness managed for nonmotorized recreation with horse and foot trails replacing four-wheel drive trails. About 10 percent of wilderness areas would have no developed trails would decrease, while areas with highly developed trail systems would comprise about 39 percent of wilderness.

Oil and gas leasing would be allowed on 38 percent of the Forest. If a pool ofoil and gas is discovered, exploration and development activities would not be visually evident, in general. They would be blended into the terrain and away from areas receiving concentrated recreation use. Further, the stipulations and standards that would probably be recommended under this alternative would reduce the risk of accidents that could exceed minimum standards for soil and water quality.

Lower amounts of timber management and treatment of sagebrush, aspen and willow would decrease the amount of area in early successional stages to about 4.2percent of the Forest. This would have some impact on such wildlife as deer, elk and moose that require early successional stages mixed with later successional stages. Wildlife summer range would increase dramatically, spring-fall range would suffer some loss, and there would be a slight increase in winter range compared with existing conditions. Conifers would continue to encroach on Spring and Fall ranges and aspen stands. Wildlife population targets established in 1985 for all species including threatened and endangered species would be met except for the North Fork elk herd unit, in which 74 percent of the target would be attained.

Economic impacts of this alternative would be relatively low in terms of support of local industries, returns to the treasury and tax revenues.

Alternative D (Preferred)

This alternative was designed to maximize net public benefits by balancing production of commodities and amenities in response to issues and concerns. The philosophy of this alternative is to emphasize amenity values while producing commodities at historic levels. This philosophy was developed through a comprehensive examination of benchmarks and their results, preliminary alternatives, and other final alternatives. As such, it combines features of Alternatives B and C, the maximum PNV benchmark, the amenity benchmark, and the District Rangers' alternative which was eliminated from detailed study.

Issues and concerns for which this alternative was designed include: maintaining viability of ecosystems on the Forest in recognition of their role in the greater Yellowstone area; providing high quality, low density recreation; meeting production needs of existing dependent commercial operations including timber, ranching, outfitting and guiding and recreation based sectors; increasing public access to the Forest; protecting and enhancing soil, air and water resources; improving wildlife habitat; and providing for oil and gas leasing and operations in a way that will blend these operations with the physical and biological features of this Forest.

This alternative was created by setting minimum production levels for each type of recreation opportunity, by Ranger District. These production levels favor high quality, low density types of recreation. Also standards and guidelines for timber harvest, grazing of domestic livestock and oil and gas leasing were included to blend these operations with amenity values, according to the management philosophy of this alternative.

Recreation management in this alternative emphasizes low density and high quality recreation. There would be an increase in developed recreation sites to disperse use and help provide capacity that may be needed when Yellowstone National Park is filled to capacity. Because seasonal access to the Forest would be increased, there would be increases in both motorized and nonmotorized recreation opportunities provided in nonwilderness areas. This would disperse such use and result in fewer contacts between recreation users. Inside wilderness, there would be an emphasis on primitive and pristine recreation experiences.

Lands managed for timber would decrease to about 85,400 acres or a decrease of about 9 percent from that under the 1976 timber management plan. The types of land managed for timber would shift toward more productive sites resulting in an allowable sale quantity of about 11.2 MMBF or about a 6 percent increase from planned harvest levels over the last 10 years.

Range management would be more intensive than management over the last 10 years and there would be a shift from grazing sheep toward grazing more cattle. Also there would be a shift away from grazing areas which are particularly sensitive for wildlife.

Road construction would be less than that planned over the last 10 years. However, road management would change to provide more roaded access on a seasonal basis. This allows such access while protecting soil, water and wildlife resources.

There would be an increase in the amount of vegetation treatments to improve wildlife habitat than has been done over the last 10 years. This coupled with standards for timber harvests which favor wildlife, will improve wildlife habitat, particularly in winter, spring and fall range.

Probable oil and gas stipulations and operating standards recommended under this alternative would be above the legal minimum necessary in specific areas. The intent of such stipulations and operating standards is to provide protection of recreation and visuals, wildlife habitat, and soil and water resources in sensitive areas based on the management strategy chosen for each area on the Forest.

This alternative provides support of local industires at historic levels. Beyond addressing the set of issues associated with economic development, this alternative provides for a high emphasis on noncommodity resources. In this way it addresses issues and concerns related to protection and maintenance of ecosystems as well as providing for low density, high quality recreation.

Expected Future Condition

About 3.5 percent of the Forest would be managed for timber. The forest condition on this portion of the Forest would be characterized by a mosaic of even-age and all-age stands; even-age stands would be about 30 acres in size, with edges blended and feathered into adjoining stands to maintain visual quality. The forest condition on the remaining timber covered area, about 40 percent of the Forest, would be dominated by old growth stands with some dead and dying trees. Within this area, there could be evidence of past fires ranging in size from 500 to 2000 acres. Visual quality would be maintained at high levels.

Domestic livestock would be found on about 10.7 percent of the forest. Rangeland on the Forest would over time be in good ecological condition. Development of range structures would proceed at about the present trend. Sagebrush-grassland areas would be managed at a high level for a mixture of sagebrush structural stages.

There would be a net increase in the amount of roads on the Forest of about 14 miles during the next 10 years. About 39 percent of the total road system would be open year round for public use. The remainder would be closed or controled seasonally with 56 percent being closed seasonally. This combination of road management strategies would provide better access to the Forest while protecting soil, water and wildlife during sensitive periods.

There would be more developed recreation sites on the Forest. These ould be scattered to keep density low, dispersing use over a wider area. Both motorized and nonmotorized nonwilderness recreation would be greater than under current management. Within wilderness, 11.5 percent of the area would be trailess and 35 percent would have a well developed trail system.

Oil and gas operations would be allowed on 38 percent of the Forest. These would not be visually evident in areas of high recreation use. Also, impacts on wildlife habitat would be minimized as well as risks to soil and water resources in sensitive areas.

Timber management and treatment of aspen and willow would provide for improved wildlife habitat in early successional stages on 5 percent of the Forest. Wyoming Game and Fish Department herd unit targets established in 1985 would be met for all herd units except the North Fork elk herd unit, in which 63 percent of the target would be attained. Grizzly bear populations would recover, and habitat would be provided for other threatened and endangered species.

Economic impacts on local areas would be relatively high in terms of support to local commodity and noncommodity oriented businesses.

Alternative E (Reduced Budget)

Given the budget problems of the Federal government over the last several years, this alternative was created to address the concern regarding what would happen if the budget of the Forest were reduced by 25 percent from its fiscal year 1982 level.

This alternative was formulated by placing an upper limit on the budget for the first decade to reflect the 25 percent reduction from the fiscal year 1982 level. Also, based on examination of the 25 percent reduced budget benchmark, which produced little timber, a minimum level of timber production was imposed to make this alternative realistic.

Expenditures for recreation of all types is lowest in this alternative. Some developed recreation sites would be closed as would facilities such as trailheads that support dispersed recreation. Recreation would revert to more primitive forms of recreation and there would be a deterioration of the trail systems through time. Areas managed for domestic livestock would decrease by 70 percent and grazing would be reduced by 56 percent. Lands managed for timber would drop to about 24,700 acres or a 74 percent decrease when compared with the 1976 timber management plan. This would result in a 71 percent decrease in planned timber harvest when compared with the last 10 years. The total road network would be reduced over the first 10 years to 960 miles of road or about 34 percent decrease from the existing road network. Of these 52 percent would be open year round for public use. Trail maintenance would be reduced to less than 50 percent of the present trail network. With the dramatic decrease in grazing of domestic livestock, there would be an increase in forage available for wildlife of about 134 percent, mostly on summer range.

About 38 percent of the Forest would be available for oil and gas leasing. Stipulations and probable operating standards for leasing and development of these resources would be set at the minimum to protect soil, water, and threatened and endangered species.

This alternative does not respond positively to any issue or concern.

Expected Future Condition

About 1.0 percent of the Forest would be managed for timber. The forest condition on this portion of the Forest would be composed of a mosaic of even and all-age stands. The even-age stands would be of varying age classes and timber sizes, found in 40 acre blocks. Boundaries of some of these stands, particularly the younger age classes, would be easy to identify on the ground because standards for feathering and blending them with surrounding areas would be minimal. Other timbered areas (about 40 percent of the Forest) would be characterized by old growth stands with dead standing timber and some timber laying on the ground. Throughout this portion of the Forest, there could be large areas (500 to 2000 acres in size) where there is evidence of wildfire, with even-age timber stands growing back.

Domestic livestock would be found on about 3.2 percent of the Forest. Ecological condition of these range lands would be at or near climax vegetation communities. Because of a dramatic decrease in treatment of sagebrush, sagebrush-grasslands would be dominated by dense stands of sagebrush.

There would be a net decrease in the amount of usable roads on the Forest of about 15 miles during the first 10 years. About 50 percent of the total road system would be open to the public year round during the first decade.

Fewer recreation facilites than currently exist, including trails, would be maintained in a high level of repair. About 49 percent of the areas classified as wilderness would have a well-developed trail system, while 10 percent would have no trails at all. There would be slightly fewer developed recreation facilities than at present, and the quality in terms of maintenance and age of structures would be significantly lowered. In the long term, trails and facilities would be in a poor state of repair and difficult to traverse. This would significantly lower visual quality and the quality of recreation experiences provided. It could also convert semiprimitive areas into areas with primitive recreation opportunities.

About 38 percent of the Forest would be available for oil and gas leasing. There would be some evidences of exploration activities. If a pool of oil and gas is discovered, development would be visually evident due to the minimum standards placed on such operations within this alternative.

Habitat for old growth dependent wildlife species would predominate. Reductions in aspen treatment and elimination of willow management would result in partial loss of those ecosystems over time, in terms of their support of certain wildlife species, except in areas where wildfire has occurred. Only 1.7 percent of the Forest would be managed for early successional stages of vegetation. Conifers would encroach on existing aspen stands, small meadows, and migration routes for wildlife, degrading wildlife habitat over time. Over the next 10 years, population targets for wildlife established in 1985 by the Wyoming Game and Fish Department would be met except for the North Fork elk herd unit. Here, only 92 percent of this target will be met. The grizzly bear would achieve a recovered population level by the end of the 50 year planning horizon.

Because of reductions in timber harvest, grazing of domestic livestock, recreation and perhaps wildlife, this alternative would have a negative impact on most sectors of the local economy. The exception is the oil and gas industry, which would be operating strictly under minimum legal standards.

Alternative F (RPA)

This alternative is designed to identify the costs and effects of meeting the Forest's share of National production of goods and services, as disaggregated in the RPA program. This alternative was required because none of the other alternatives meet the target for forage for domestic livestock given in RPA targets. (A number of alternatives meet or exceed RPA targets for timber and recreation.)

This alternative was created by setting production targets for the first 10 years equal to those assigned to the Forest by the RPA program.

All exisiting developed recreation areas would be maintained. No new facilities would be constructed. In nonwilderness areas on the Forest, there would be a shift toward nonmotorized recreation. In wilderness areas there sould be a shift away from primitive recreation with modest increases in pristine and semi-primitive recreation opportunities. There would be a 4 percent decline in areas managed to provide forage for domestic livestock. Management of this land would be more intensive than in the past leading to an increase in grazing of about 4 percent. Lands managed for timber would drop to 82,900 acres or an 11 percent decrease when compared with the 1976 timber management plan. Planned timber harvest levels would be about the same as levels planned in the last ten years. There woudl be a decrease in new road construction of about 25 percent when compared with existing plans. Road management would shift to more seasonal road closures (36 percent of roads) and complete road closures (10 percent). Management for wildlife would increase and there would be an increase of about 6 percent in wildlife forage available. Oil and gas leasing and operations would be allowed on 38 percent of the Forest with stipulations and probable operating standards designed to meet minimum legal requirements for protection of soil, water, and wildlfie resources.

By meeting or exceeding historic production levels of commodities including developed recreation, this alternative would support current sectors of the economy at the same level as in the last ten years. This addresses issues and concerns surrounding production of commodities and support of local economies. However, the standards guiding such production including those for oil and gas production would continue current public debates and heat up controversys.

Expected Future Condition

About 3.5 percent of the Forest would be managed for timber. The forest condition on this portion of the Forest would be composed of a mosaic of even and all-age stands. The even-age stands would be of varying age classes and timber sizes, found in 40 acre blocks. Boundaries of some of these stands, particularly the younger age classes, would be easy to identify on the ground because standards for feathering and blending them with surrounding areas would be minimal. Other timbered areas (about 40 percent of the Forest) would be characterized by old growth stands with dead standing timber and some timber laying on the ground. Throughout this portion of the Forest, there could be large areas (500 to 1000 acres in size) where there is evidence of wildfire, with even-age timber stands growing back. Most areas where there are currently stands of aspen would be maintained and treated through time to counter encroachment by conifers.

Domestic livestock would be found on about 10.7 percent of the Forest. Ecological condition of these and other range lands would be at or near climax vegetation communities. This would be true except for about one percent of the Forest where sagebrush-grassland ecosystems would be managed for a mosaic of sagebrush age classes.

There would be a net increase in the amount of roads on the Forest of about 34 miles over the first 10 years. About 47 percent of the total road miles would be open to the public year round during the first decade. Road closures and controlled use on the remainder would provide for less disturbance of wildlife.

All currently existing recreation facilities including trails, would be maintained in a high level of repair. About 41 percent of the areas classified as wilderness would have a well-developed trail system, while 11 percent would have no trails at all.

About 38 percent of the Forest would be available for mineral leasing. There would be some evidences of exploration activities. If a pool of oil and gas is discovered, development would be visually evident due to the minimum standards placed on such operations within this alternative.

Wildlife population targets established in 1985, including a recovered population of grizzly bears, would be met. The only exception to this would be within the North Fork of the Shoshone herd unit for elk. In this herd unit, 57 percent of the target for elk would be met. Timber operations along with planned treatment of sage brush, aspen and willow, would provide a healthy forest condition in early successional stages on about 5 percent of the Forest.

Impacts on local economies would be greater than at present due to increases in domestic livestock grazing and recreation, and due to support of timber operations at or near current levels.

COMPARISON OF ALTERNATIVES

The purpose of forest planning is to identify and select for implementation that alternative that maximizes net public benefits. Net public benefits are defined as the overall long-term value to the nation of all outputs and positive effects, whether they can be quantified or not, consistent with the principles of multiple-use and sustained yield management.

This section presents summaries and comparisons of responses to: issues, concerns and opportunities; outputs; physical and biological effects; economic efficiency effects; economic impact effects; and social effects. The information presented in this section is based on Chapter III, the Affected Environment, and Chapter IV, Environmental Consequences. Outputs and effects for each analysis area were estimated and are in Planning Records. Summarized here are forestwide totals of outputs and effects. The comparison of alternatives across several dimensions presented in this section defines differences between alternatives.

Although the range of alternatives considered in detail may appear narrow considering production levels of goods and services, the alternatives do represent the range necessary to address issues and concerns (Planning Problem Statements) identified in Chapter I. The level of goods and services produced on the Forest is controlled by several factors. For example, over 56 percent of the Forest is wilderness, tentatively suitable timberland is only about 6 percent of the Forest, and land suitable for grazing domestic livestock is only 12 percent of the Forest. Both tentatively suitable timberland and land suitable for grazing livestock are scattered throughout the Forest to a degree that intensive management of these lands has little effect on adjacent lands. In addition, the Forest has much more wildlife summer forage than winter forage which greatly reduces management options for improving wildlife habitat. A complete description of management options available and how they were analyzed is presented in Appendix B.

RESPONSE TO ISSUES, CONCERNS, AND OPPORTUNITIES

Chapter I presented a synthesis of public issues, management concerns, and opportunities (see Appendix A) that guided development of the six alternatives. Table II-4 provides a detailed response to each planning problem statement representing these issues, concerns and opprotunities. For each planning problem statement, the response is discussed by alternative. References are made to Table II-5 and II-6 which display average annual outputs, effects and activities for each alternative for the first 10 years and then projections over the next 50 years respectively. Also given in Table II-4 is a discussion of management direction designed to protect minimum resource requirements in all alternatives.

A measured output, effect, or activity would generally respond to more than one planning problem statement. This is a result of the multiple-use production resulting from management of complex ecosystems. Response to all planning problem statements involved developing FORPLAN prescriptions that combine compatible activities in specific subdivisions of the Forest to produce desired effects in a cost efficient manner. This is different than modeling prescriptions that have an single emphasis on one land type covering noncontiguous areas across the Forest. Table II-4 attempts to illustrate those outputs and effects that most directly relate to a given problem statement.

TABLE II-4

Comparison of Alternative Responses to Planning Problem Statements

Planning Problem #1	How can timber management be balanced to meet other resource needs and contribute to a healthy local economy.
Related Outputs and Activities (See Tables II-5 and II-6)	Suitable Acres Planting (Reforestation) Selection Cut Overstory Removal Poletimber Harvested Sawtimber Harvested Preservation Visual Quality Partial Retention Visual Quality Maximum Modification Visual Quality Clearcut Harvest Commercial Thinning Seedcut Timber Stand Improvement Fuelwood Visuals Rehabilitation and Enhancement Retention Visual Quality Modification Visual Quality
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein for the attainment and maintenance of a healthy forest environment from a variety of resource standpoints. In particular, such direction is found under: Diversity on National Forests; Wild and Scenic River Management; Visual Resource Management; Wildlife Habitat Improvement and Maintenance; Silvicultural Examination and Prescription; Reforestation; Riparian Area Management; Water Resource Improvement and Maintenance; Soil Resource Management; and Fuel Treatment. General Forest Direction is also provided under Insect and Disease Management/Suppression. Such Direction and standards tend to be broad to allow actual management to be tailored to fit specific circumstances given the philosophy of an alternative. Alternatives C and D call for timber operations Direction and standards using interpretations that will favor wildife, visuals and recreation. Projected average annual sawtimber demand increases from 12 to 14 million board feet over the next 50 years. All alternatives except C and E approach this level of demand in allowable sale quantity. Alternative B produces the most sawtimber over the planning horizon at 12.1 million board feet annually. The long term sustained yield level of Alternatives A, B, D and F exceed the 14 MMBF level, but won't reach this level until about the 15th decade. By that time demand may have increased beyond this.
Comparative Response by Alternative	
A (Current Direction - No Action)	Timber harvest levels would be programmed at or above the average for the last five years. Acres under timber management would decrease from the 1976 Timber Management Plan to 89,000 acres. Programmed sales would increase by 0.7 million board feet per year to an average annual 11.2 MMBF of sawtimber. Areas of low water quality would be improved as more and more activities are carried out with appropriate standards and guidelines. Visual quality rehabilitation and enhancement activities would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modification categories by 24 percent.
B (Commodity)	Timber output would be increased significantly above the level set in the 1976 Timber Management Plan. The amount of timber land defined as suitable would increase by about 12,500 acres from the 1976 Timber Management Plan to 106,000 acres. Annual programmed harvest would rise by 1.6 million board feet to 12.1 MMBF.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

B (Commodity) (Continued)	This level of harvest would help reduce insect and disease problems by harvesting more of the mature and over-mature timber. Due to increased roading and timber harvest, water yield and peak flow would both increase which would reduce water quality. This effect would be slight Forest-wide, but may be significant in some areas. The increased timber harvest level would cause more of the Forest to be managed for earlier successional stages of vegetation. This increase would aid in meeting wildlife population targets. Visual quality rehabilitation and enhancement activities would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modificiation categories by 30 percent.
C (Noncommodity)	Programmed timber sales offered would drop to around 85 percent of the average annual harvest for the last five years and to 70 percent (8.6 MMBF) of the average annual sales offered under current management. In selected areas, timber cutting would be carried out in a manner designed to increase water yield. Acres under timber management would decrease from the 1976 Timber Management Plan to 71,000 acres. With lower annual harvest levels, the risk of insect and disease problems would be increased as existing mature and over-mature timber remains unharvested. Increases in water yield and the enhancement of summer runoff resulting from this alternative could not be considered significant. In selected areas, water quality improvement would be significant, though Forest-wide there would not be much improvement over current levels. Visual quality rehabilitation and enhancement activities would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modification categories by 20 percent.
D (Preferred)	Programmed timber sales would remain near current levels at an annual average of about 10.7 million board feet over the planning horizon. Timber management would be planned on about 8,000 acres less than in the 1976 Timber Management Plan or 85,400 acres. The mix of clearcut, shelterwood and selection systems would be about the same as current direction and timber yield would be about 0.2 million board feet higher than that under the 1976 Timber Management Plan. With this alternative, there would be a significant increase in vegetation manipulation to improve wildlife habitat. This would provide more areas in early successional stages than is currently planned. Water quality in some areas of the Forest would be improved over conditions under current management. Visual Quality rehabitation and enhancement activites would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modification categories by 30 percent.
E (Reduced Budget)	Programmed timber sales would drop to 27 percent of current levels to 2.8 million board feet per year. Water yield and peak flows would drop due to decreased roading and timber harvest. Timber management in this alternative occurs on 24,700 acres compared to the present 93,500 acres. Water quality Forest-wide would remain near current levels. In some areas, water quality would be maintained over current trends due to road closures and decreased timber related activities; in other areas, water quality would decrease due to lower levels of monitoring and administration, reflecting lower management standards. Vegetation Forest-wide would tend to be in

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

E (Reduced Budget) (Continued)	late successional stages, which would affect wildlife species diversity, visual diversity, and the incidence of forest insect and disease problems. Visual quality rehabilitation and enhancement activities would be carried out to a lesser degree than in all other alternatives, primarily because of the decreased need for them under a reduced timber program. Total acres in the modification and maximum modification categories would be reduced 30 percent over the planning horizon.	
F (RPA)	Programmed timber sales would be slightly below those in the 1976 Timber Management Plan with an annual allowable sale quantity of about 10.4 million board feet over the planning horizon. Timber management would occur on 82,900 acres, which is about 10,000 less than the suitable base under the 1976 Timber Management Plan. Areas contributing to lower water quality would generally improve as activities are carried out with appropriate standards and guidelines. Visual quality rehabilitation and enhancement activities would be carried out in all areas necessary to meet quality objectives, reducing total acres in the modification and maximum modification categories by 28 percent.	
Planning Problem #2	Providing an adequate variety, amount, dispersion and quality of recreation opportunities amid the inherent conflicts between Forest uses.	
Related Outputs and Activities (See Tables II-5 and II-6)	Developed Public Recreation RVD's Facility Construction and Reconstruction Dispersed Motorized RVD's Primitive Nonwilderness Acres Roaded Natural Acres Rural Acres Acres Open to Snowmobiles Acres Closed to Snowmobiling See also Visual Quality Objectives under Planning Problem #1	Developed Private Recreation RVD's Downhill Skiing RVD's Nonmotorized RVD's Wildlife and Fish RVD's Semiprimitive Motorized Acres Dispersed Facility Construction and Reconstruction Acres Restricted to Snowmobiling Semiprimitive Nonwilderness Nonmotorized Acres
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein to minimize conflicts between recreation uses and other Forest uses, and between conflicting recreation uses. In particular, such direction is found under: Visual Resource Management; Management of Developed Recreation sites; Dispersed Recreation Management; Recreation Management (Private and Other Public Sectors); Wilderness Area Management; and Trail System Management. A complete spectrum of recreation opportunities: dispersed recreation, developed public and private recreation (including skiing), are provided in every alternative. Variation between alternatives is provided by differing emphasis on particular kinds or qualities of recreation. The Forest's capacity to accomodate most recreation uses is greater than the anticipated demand for those uses. Though Yellowstone National Park has not identified their capacity for developed recreation which could impact demands for such recreation on the Forest, it appears that demands for developed recreation will be met in all alternatives except Alternative E.	

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	The greatest amount of nonwilderness recreation in terms of RVD's is provided in Alternatives C and D. Developed public and private recreation is greatest in Alternative B, but is not significantly greater than in Alternative D. All alternatives produce recreation opportunites at or near the maximum which would be consumed. Alternative D provides the most motorized access to the Forest for recreation. Alternative C produces the most nonmotorized recreation.
Comparative Response by Alternative	
A (Current Direction - No Action)	Distribution of recreation opportunities and type of recreation opportunities available would remain the same as is currently available on the Forest. No new developed or dispersed recreation facilities would be constructed. All existing developed and dispersed recreation areas would be managed at acceptable levels to provide the same recreation experiences as in the past. The current mix of recreation opportunities would be provided both in and out of wilderness. Visual quality would deteriorate somewhat as timber operations and oil and gas production are carried out under minimum standards. This may not affect a significant portion of the Forest, but may be dramatic in some areas.
B (Commodity)	For this alternative, developed recreation production was set to meet or exceed demand on each Ranger District. Dispersed recreation opportunities are also provided at levels which exceed the amount that will be consumed. Visual quality may be slightly less than under Alternative A because of a slight decrease in visual standards for oil and gas operations in some areas on the Forest. Production of commodity goods and services including developed recreation would be higher than current levels. All developed recreation areas currently available would remain open and the amount of reconstruction of recreation areas would be increased. Nonwilderness recreation opportunities would increase for all forms of recreation compared with Alternative A, though the mix will remain about the same. In wilderness, there would be a shift from both pristine and semiprimitive recreation experience to more primitive recreation opportunities. This shift means that more areas will have low density trails and level of use will be dispersed and would decrease slightly than under Alternative A. Enough wilderness recreation opportunities would be provided to meet expected increases in use. The visual quality would deteriorate somewhat as timber operations and oil and gas production are carried out under minimum standards. This may not affect a significant portion of the Forest, but may be dramatic in some areas.
C (Noncommodity)	This alternative would provide sufficient amounts of different types of recreation opportunities to satisfy demand on each Ranger District. Developed recreation capacity would decrease slightly from that which would be produced under Alternative A, but expenditures for construction/reconstruction of developed facilities would increase slightly compared with Alternative A. The Forest would be less accessible for motorized recreation due to the number of roads closed year-long rather than seasonally. Under this alternative, developed recreation capacity would drop slightly, but the quality of recreation experience offered would be about the same as in Alternative A.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements	
C (Noncommodity) (Continued)	There would be a significant increase in all nonwilderness dispersed recreation and the amount produced is higher than all other alternatives. Visually, the Forest would improve in appearance over Alternative A through time. This is due to more restrictions on oil and gas operations, and standards on timber harvest which emphasize visual quality. Thus, the amount of timber management is lower than in Alternative A and the effects of such management are not as visually evident.
	The mix of wilderness recreation opportunities would not change significantly from those provided in Alternative A; there would be a slight shift toward semiprimitive recreation opportunities.
D (Preferred)	This alternative would provide sufficient amounts of different types of recreation opportunities to satisfy demand on each Ranger District. Developed recreation capacity and construction/reconstruction expenditures would increase compared with Alternative A. Dispersed recreation capacity would be increased from Alternative A with construction/reconstruction expenditures dropping slightly.
	Developed recreation would be produced at levels slightly higher than Alternative A and maintenance of recreation facilities would be to a higher standard. Dispersed recreation capacity would increase greatly over Alternative A. The acres allocated to different recreation opportunities would be changed slightly, becoming more balanced when maintained or enhanced through management. All management activities would be planned to meet high visual standards. This, coupled with an increase in nonmotorized recreation areas and improved wildlife habitat, would reduce the impact of the sights and sounds of man from Alternative A.
	There would be a slight change in wilderness recreation opportunities when compared with Alternative A. These would be a slight shift toward pristine and primitive recreation, attended by a decrease in semiprimitve opportunities.
E (Reduced Budget)	Developed recreation capacity would drop 15 percent while developed recreation construction/reconstruction expenditures drop 17 percent. This shows a decrease in quality of the developed recreation use over time compared with Alternative A. Because of lower amounts of trail maintenance, reduced access, and lower expenditures for recreation use management, the recreation experiences offered would shift toward experiences of low quality. The same would be true of wilderness opportunities provided. Visual quality would be the lowest in this alternative and would deteriorate through time.
F (RPA)	For this alternative, developed recreation production was set to meet or exceed demand on each Ranger District. Dispersed recreation opportunities over time would be similar to those provided in Alternative A.
	Developed recreation capacity would be provided at about the same level as in Alternative A and at about the same quality. Dispersed wilderness recreation use capacity would increase from Alternative A with a shift from primitive to semiprimitive recreation opportunities. Dispersed nonwilderness recreation use capacity would increase significantly over Alternative A with dispersed facility construction/reconstruction expenditures increasing slightly compared with Alternative A.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Planning Problem #3	Providing for adequate levels and kinds of livestock grazing in view of other resource needs and uses.
Related Outputs and Activities (See Tables II-5 II-6)	Cattle Forage Sage Management Acres Range Improvement - Fencing Acres of Range Suitable and Open Sheep Forage Noxious Weed Treatment Acres Range Improvements - Other
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein to minimize conflicts between livestock grazing and other Forest uses and resource needs. In particular, such direction is found under: Wilderness Area Management; Range Resource Management; Range Improvement and Maintenance; and Riparian Area Management. Alternative F provides the highest level of grazing use, but produces at a level well above what is considered adequate in terms of demand. Alternatives A, B, D, and F all provide for total grazing at levels above the current stocking, but differ significantly in regard to sheep numbers. Alternative D de-emphasizes sheep in response to the local market trend. The reduced budget alternative provides the least forage for domestic cattle. Alternative C provides a level of stocking below the current permitted, but near the currently stocked numbers. Under all alternatives compared to A, slight decreases in intensive range management activities, water developments, fencing and sagebrush treatment would occur because of decreases in open range for cattle. Reductions in permitted livestock numbers Forest-wide would be required initially in Alternatives C and E. While Alternatives A, B, D, and F would not decrease permitted domestic livestock numbers Forest-wide, reductions in numbers would occur on some allotments to provide for wildlife forage needs and to adjust stocking levels to meet existing capacities. Conversely, upward adjustments would be available on some allotments that are presently stocked below existing capacities for domestic livestock. Total current permitted livestock, Forest-wide is about 77,100 AUM's.
Comparative Response by Alternative	
A (Current Direction - No Action)	Range management would be guided by existing allotment plans. Most of the range suitable for domestic livestock would be available for term grazing permits. The remainder would be available for use by transportation livestock and wildlife. Suitable and open range used by livestock would comprise about 272,000 acres of the Forest. Range condition would improve over the next 50 years until all range is in good condition. Because of this increase in range condition, grazing capacities would be increased 34 percent above current permitted numbers, Forest-wide.
B (Commodity)	Range production capacity would be significantly higher than current consumption. Suitable and open range used by livestock would comprise about 256,000 acres of the Forest. By the end of the planning horizon, grazing capacities would be increased 36 percent above current permitted numbers, Forest-wide; this is two percent greater than the final capacity achieved under current direction. Range condition would improve over the next 50 years until all range is in good condition.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

C (Noncommodity)	Domestic livestock grazing capacity would be provided at about 99 percent of current capacity levels by the end of the planning horizon. Suitable and open range used by livestock would comprise about 204,000 acres of the Forest. This is 26 percent less than the final capacity achieved under Alternative A. In some areas improvement of range condition would occur at a faster rate than under Alternative A. Not all suitable range would be used for domestic livestock grazing, and many areas of suitable range would be grazed below capacity. Because of the location of suitable range on the Forest, most of this decrease in use by livestock would be in wildlife summer range.
D (Preferred)	Suitable and open range used by livestock would comprise about 260,000 acres of the Forest. By the end of the planning horizon, grazing capacities would be increased 32 percent above current permitted numbers, Forest-wide; this is one percent less than the final capacity achieved under Alternative A. Range would be managed much the same as under Alternative A with a few areas where grazing systems and scheduled range improvements will change. There will be a shift in the mix of livestock grazed with the number of domestic sheep dropping with comparative increases in cattle. This is in response to current shifts in demand.
E (Reduced Budget)	Domestic livestock grazing would drop to 46 percent of current capacity in the first decade following implementation. Suitable and open range used by livestock would comprise about 80,000 acres of the Forest. By the end of the planning horizon, grazing capacities would be 54 percent of the current permitted numbers, Forest-wide; this is about 60 percent less than the final capacity achieved under Alternative A. Suitable range would move toward good condition, but less intense management of these lands would allow later successional stages to predominate and could lead to a decrease in suitable range because of invasion of undesirable range species.
F (RPA)	**Most range suitable for domestic livestock would be managed intensively with many improvements. Suitable and open range used by livestock would comprise about 261,000 acres of the Forest. By the end of the planning horizon, grazing capacities would be 40 percent above current permitted numbers, Forest-wide; this is 5 percent greater than the final capacity achieved under Alternative A. This increase over Alternative A is achieved through more intense management of suitable range and includes an increase in forage available to wildlife. Suitable range would improve until all range is in good condition.**
Planning Problem #4	Management of wilderness areas to best satisfy legal requirements and public needs.
Related Outputs and Activities (See Tables II-5 and II-6)	Dispersed Wilderness RVD's Primitive Wilderness Acres Pristine Wilderness Acres Semiprimitive Wilderness Acres
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein to manage wilderness within legal requirements, and at a level of quality that basically meets public needs. In particular, such direction is found under: Wilderness Area Management; Dispersed Recreation Management; and Recreation Management (Private and Other Public Sectors). If recreation use exceeds capacities established for any specific management area

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	within a wilderness, management actions to reduce unacceptable use levels could consist of road (wilderness access) and trail restrictions or closures, permit systems or other management actions. Wilderness and Wilderness Study Area acres do not vary by alternative. An appropriate mix of wilderness recreation opportunities and settings is provided in all alternatives except E, where they devolve toward semiprimitive. Alternative D produces the most pristine wilderness, Alternative B the most primitive, and E the most semiprimitive. The general balance and distribution of the opportunity classes remains the same in Alternatives A, B, C and D. In Alternatives E and F more acres are managed for semiprimitive opportunities and less for primitive. Alternative E represents the probable effect of long term wilderness management with a reduced budget; primitive opportunities would be reduced to semiprimitive due to less control of wilderness access and less administrative contact with users. All alternatives except E meet the intent of the Wilderness Act.
Comparative Response by Alternative	
A (Current Direction - No Action)	Dispersed wilderness recreation visitor days would be expected to increase above current use to 206 MRVD's over the first 10 years. Pristine wilderness recreation recreation opportunities would be available on about 11 percent of the total Forest wilderness system; about 53 percent would provide primitive wilderness opportunities; and the remaining 36 percent would be semiprimitive.
B (Commodity)	Dispersed wilderness recreation visitor days would be less in this alternative compared with Alternative A, at 200 MRVD's. Pristine wilderness recreation opportunities would be available on 10 percent of the total Forest wilderness sytem; 56 percent would provide primitive wilderness opportunities; and the remaining 34 percent would be semiprimitive. This is a shift toward primitive opportunities compared to Alternative A.
C (Noncommodity)	Dispersed wilderness recreation visitor days would be expected to increase more in the first decade compared with Alternative A, to a level of 230 MRVD's. Pristine wilderness recreation opportunities would be available on less than 10 percent of the total Forest wilderness system; 51 percent would provide primitive wilderness opportunties; and the remaining 39 percent would be semiprimitive. This is a shift from pristine and primitive opportunities to semiprimitive opportunities compared with Alternative A.
D (Preferred)	Dispersed wilderness recreation visitor days would be exceed current use but would rise to only 196 MRVD's in the first 10 years. Pristine wilderness recreation opportunities would be available on 12 percent of the total Forest wilderness system; about 53 percent would provide primitive wilderness opportunities; and the remaining 35 percent would be semiprimitive. This shows a slight shift toward pristine and primitive recreation opportunities compared with Alternative A.
E (Reduced Budget)	Dispersed wilderness recreation visitor days and quality would be expected to increase less in the first decade compared with Alternative A.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements	
E (Reduced Budget) (Continued)	Pristine wilderness recreation opportunities would be available on 10 percent of the total Forest wilderness system; 41 percent would provide primitive wilderness opportunities; and the remaining 49 percent would be semiprimitive. This is a shift toward semiprimitive opportunities compared with Alternative A, but because of reduced expenditures in this alternative, these opportunities will degenerate to low quality recreation opportunities.
F (RPA)	Dispersed wilderness recreation visitor days would be expected to increase in the first decade more than in Alternative A, to a level of 220 MRVD's. Pristine wilderness recreation opportunities would be available on 11 percent of the total Forest wilderness system; 48 percent would provide primitive wilderness opportunities; and the remaining 41 percent would be semiprimitive. This represents a shift toward semiprimitive opportunites compared with Alternative A.
Planning Problem #5	Providing an adequate level of road and trail system development and maintenance.
Related Outputs and Activites (See Tables II-5 and II-6)	Road Maintenance - Total Miles Miles of Roads Obliterated Miles of Road Closed Miles of Road Open Miles of Trail Maintenance and Reconstruction Miles of Road Construction and Reconstruction Miles of Road Controlled Miles of Trail Construction See also Timber and Recreation-related outputs.
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein to maintain roads and trails, and the transportation system in general, at standards commensurate with expected types and quantities of use. In particular, such direction is found under: Transportation System Management; Arterial and Collector Road Construction and Reconstruction; Local Road Construction and Reconstruction; Road Maintenance; Trail System Management; and Trail Construction and Reconstruction. Roads and trails would be constructed or reconstructed under all alternatives to meet recreation and timber goals and objectives. Road closure, road obliteration and road control also occurs under all alternatives. What is judged as an adequate level of transportation system development is variable by the emphasis of the alternative in question. The road and trail system does not change appreciably by alternative, except in Alternative E where about one third of the roads and over half the trails would be abandoned during the first 10 years.
Comparative Response by Alternative	
A (Current Direction - No Action)	**This alternative calls for new road construction of 76 miles of road in the next 10 years and obliteration of 48 miles. It calls for 40 percent of the roads to be open all year to the public, 54 percent would be controlled with seasonal closures and the remaining 6 percent would be closed to public use. It provides for a net increase in roads of about 165 miles of road by the end of the next 50 years for a total road system of 1,614 miles.**

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

A (Current Direction - No Action) (Continued)	About 69 miles of new trail are projected to be constructed, bringing the trail system to a total of 1,363 miles by the end of the next 50 years.
B (Commodity)	This alternative provides for construction of 66 miles of road in the next 10 years and obliteration of 48 miles. The road system would have 4 percent fewer miles than Alternative A. On the average over the planning horizon, about 41 percent of the roads will be open all year for public access; 42 percent will be controlled using seasonal closures; and 17 percent will be closed year round to the public. This represents a significant shift in road management when compared with current direction. It provides for a net increase in roads of 107 miles by the end of the planning horizon. About 33 miles of new trail are projected to be constructed over the next 50 years, bringing the trail system to a total of 1,330 miles.
C (Noncommodity)	This alternative provides for 71 miles of new road construction and 48 miles of road obiliteration over the next 10 years. Over the planning horizon, about 42 percent of the roads will be open all year to the public; 38 percent will be controlled seasonally; and 20 percent will be closed year round. This represents a shift to more road closures than in Alternative A and fewer roads with seasonal restrictions over the long term. This alternative provides for a net increase of 134 miles of road by the end of the planning horizon. Next to Alternative A, this is the greatest increase in roads found in any alternative. About 62 miles of new trail are projected to be added to the trail system in the next 50 years, bringing the trail system to a total of 1,362 miles.
D (Preferred)	This alternative provides for construction of about 66 miles of new road and obliteration of 52 miles of road over the next 10 years. Over the planning horizon, about 41 percent of roads will be open for public use year round, 54 percent will be controlled with seasonal closures, and 5 percent will be closed all year long. This reflects the philosophy of this alternative to disperse recreation use to provide high quality recreation opportunities while protecting soil, water, and wildlife resources. It provides for a net increase of 115 miles of road by the end of the planning horizon. About 64 miles of new trail are projected to be added to the trail system over the next 50 years to provide a trail system of about 1,364 miles.
E (Reduced Budget)	This alternative provides for 10 miles of new road and 25 miles of road obliteration over the next 10 years. There will be an additional decrease in roads during the first ten years as about 500 miles of road will be abandoned. Over the planning horizon 52 percent of the roads will be open all year long, 36 percent will be controlled seasonally and 12 percent will be closed. Over the planning horizon, this alternative provides for a net increase of 75 miles of road, the least of any alternative.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

E (Reduced Budget) (Continued)	**There will be a 57 percent decrease in maintained trails on the Forest over the first decade, and at the end of 50 years only 29 miles of new trails are projected for construction. At that time the system would consist of 588 miles of trail.**
F (RPA)	**This alternative provides for 56 miles of new road and 48 miles of road obliteration over the next 10 years. Over the planning horizon 50 percent of the roads will be open year long to the public, 39 percent will be controlled with seasonal restrictions, and 11 percent will be closed year long. Over the planning horizon, it provides for a net increase of 106 miles of roads.** **About 63 miles of new trail are projected to be added to the system in the next 50 years for a total of 1,330 miles.**
Planning Problem #6	Providing adequate levels and quality of wildlife and fish habitat in response to increased competition for those lands by other resource uses.
Related Outputs and Activities (See Tables II-5 and II-6)	Sage Management Willow Management Aquatic Habitat Improvement Crucial Preferred Winter Range - Deer and Elk Moose Bighorn Sheep Mountain Goat Aspen Management Structural Improvements Wildlife Forage
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein that protects the basic habitat requirements of indicator species on the Forest. In particular, such direction is found under: Wildlife and Fish Resource Management; Riparian Area Management; and Wildlife Habitat Improvement and Maintenance. Other direction, found in management area prescriptions for riparian habitats, indicator species and big game winter range, is applied uniformly in all alternatives. All alternatives provide for sufficient wildlife habitat to meet the on-Forest portions of the State's wildlife population objectives by herd unit as established in 1985, except for the Wapiti Ridge Bighorn Sheep Herd Unit (the South Fork population) and the North Fork Elk Herd Unit. Alternative A provides for only 40 percent of the habitat required to meet the State's bighorn sheep population objective for the South Fork area. None of the alternatives provide for sufficient habitat for the State's North Fork Elk Herd Unit objective. Reduction or elimination of all domestic livestock grazing on all or portions of the allotments within this herd unit would not allow sufficient forage to meet the State's population objective in this herd unit. Over the planning horizon, Alternative C would improve the most habitat on big game winter range and increase the Forest's share of wintering population objectives. Alternative E would provide the greatest amount of forage reserved for wildlife due to reductions in permitted livestock numbers but does not apply measures for improving winter ranges to the extent all other alternatives do. Aquatic habitat would be protected in all alternatives by standards for water quality and riparian area management.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Comparative Response by Alternative	
A (Current Direction - No Action)	Wildlife habitat improvment would neither increase nor decrease substantially. All but two Wyoming and Game and Fish Department population targets for wildlife, would be met. Only 40 percent of the North Fork Bighorn Sheep Herd Unit (South Fork population) could be met and only 57 percent of the North Fork Elk Herd population objective could be achieved. Average annual vegetation treatment for improvement of wildife habitat over the next 10 years would be about 420 acres. Over the planning horizon, average annual treatments decline to about 380 acres. Timber management would provide some benefits to wildlife by improving forage to cover ratios in some areas on the Forest even though for such harvest would not optimize this effect. Minimum standards for protection of wildlife habitat would be included in oil and gas leases, but if major field were developed, there could be significant local impacts on wildlife.
B (Commodity)	Wildlife habitat treatment and wildlife forage would increase in this alternative when compared with Alternative A. Vegetation treatment would average of 521 acres annually over the first 10 years. Over the planning horizon this decreases to about 470 acres per year. When combined with more intensive management of range ecosystems, there would be significant improvement of winter range. Even with these improvements, only 60 percent of the North Fork Elk Herd Unit populations objective could be achieved. The large increase in area managed for timber would improve forage to cover ratios in many areas, even though standards on harvest are not optimum from a wildlife perspective. The effect of oil and gas operations would be the same as in Alternative A.
C (Noncommodity)	Like alternative B, wildlife habitat improvement activities and wildlife forage would both increase substantially over current levels. All but one Wyoming Game and Fish Department population target for wildlife would be met. Only 74 percent of the North Fork Elk Herd Unit population objective could be achieved. Average annual vegetation treatments for improvement of wildlife habitat during the first 10 years would be 518 acres. Over the planning horizon this decreases to an average of 492 acres. Forage available to wildlife increases 70 percent compared with Alternative A. However, most of this increase will be in summer range where there is already adaquate forage. Decreases in timber management in this alternative will lessen the ability of management to improve cover to forage ratios in spring and fall range. However, standards for timber management will optimize positive effects. Also standards on oil and gas activities would minimize impacts on wildlife even if there are major field developments.
D (Preferred)	Wildlife habitat improvement increases significantly when compared with Alternative A. Forage available for wildlife from range suitable for grazing by domestic livestock remains essentially the same as in Alternative A. All population targets including those identified by the Wyoming Game and Fish Department would be met except for the North Fork Elk Herd Unit population objective. Only 63 percent of this target could be achieved. Average annual vegetation treatments for improvement of wildlife habitat during the first 10 years would increase to 552 acres, the highest of all alternatives. Over the planning horizon the average annual treatment would decrease

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

D (Preferred) (Continued)	to about 470 acres. Timber harvest would be only slightly less than in Alternative A and standards for such harvest would optimize its effects on wildlife. Standards on oil and gas operations would be less than in Alternative C, but would be applied with discretion to have the same effect on wildlife as in Alternative C.
E (Reduced Budget)	Wildlife habitat improvement would decrease from current levels. Forage allocated to wildlife would increase substantially from current, primarily in summer range areas which do not represent a limiting factor for big game populations on the Forest. All but one population target, including those identified by the Wyoming Game and Fish Department, would be met; only 92 percent of the North Fork Elk Herd Unit population objective could be achieved. Average annual vegetation improvements for wildlife habitat planned for the first 10 years would treat 309 acres. Over time, a decrease in such treatments (to 102 acres annually), coupled with a decrease in sage treatment for cattle, and decreases in timber management, mean that 99 percent of the forest would be dominated by late successional vegetation. This would favor late-successional dependent wildlife species, such as goshawk and marten, over early-successional and all-age dependent species, such as elk and bighorn sheep. Standards for timber harvest would not optimize the effect of such harvest on wildlife. Standards for oil and gas operations would meet minimum wildlife needs, but could allow significant effects.
F (RPA)	Wildlife habitat treatment needs would increase in this alternative when compared with Alternative A. Forage from range suitable for domestic livestock grazing would be essentially the same as in Alternative A. All population targets including those identified by the Wyoming Game and Fish Department would be met except that only 57 percent of the North Fork Elk Herd Unit population objective could be achieved. Vegetation treatments for wildlife habitat during the first 10 years would improve 498 acres. This would decrease to an average annual treatment of 434 acres over the planning horizon. Timber management would not be done under standards that would optimize its effect on wildlife. Standards for oil and gas operations would have about the same effect as Alternative A.
Planning Problem #7	Management of Threatened and Endangered Species on the Forest and the achievement of recovered populations.
Related Outputs and Activities (See Tables II-5 and II-6)	Grizzly Bear Situation I Grizzly Bear Situation III Grizzly Bear Situation II Bald Eagle and Peregrine Falcon Habitat
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein for management of threatened and endangered Species, particularly the grizzly bear. Such direction is found under Wildlife and Fish Resource Management, which incorporates by reference the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area." All T&E species are included as management indicators; direction for Management Area 4B, which provides standards and guidelines for indicator species, is applied uniformly through all alternatives. All management is designed to achieve recovered populations.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	Management Area Prescripton 4F is applied in varying degrees in Alternatives B, C and E. This prescription provides for the enhancement of grizzly bear habitat to accelerate the recovery of the bear population.
Comparative Response by Alternative	
A (Current Direction - No Action)	Grizzly bear habitat would be managed to achieve a recovered population. Habitat needs of the bald eagle, peregrine falcon, black-footed ferret and gray wolf (if reintroduced) would be protected.
B (Commodity)	Grizzly bear habitat enhancement practices (Prescription 4F) would be applied to about 156,000 acres in grizzly bear Situation I habitat. Such practices would regulate or prohibit human uses in favor of the needs of grizzly bears, to achieve a recovered bear population at an accelerated rate. Practices ensure the minimization of grizzly/human contacts within the prescription area. Habitat needs of the bald eagle, peregrine falcon, black-footed ferret and gray wolf (if reintroduced) would be protected.
C (Noncommodity)	Same as Alternative B, except the grizzly bear enhancement prescription (4F) would be applied to about 13,000 acres of Situation I habitat.
D (Preferred)	Same as Alternative A.
E (Reduced Budget)	Same as Alternative A. Though decreases in planned management activity in this alternative may benefit the grizzly bear, decreases in education, law enforcement, and habitat improvement would outweigh such benefits. Thus the reduced budget alternative overall would reduce the rate of recovery of the grizzly bear.
F (RPA)	Same as Alternative B, except the grizzly bear enhancement prescription (4F) would be applied to about 81,000 acres of Situation I habitat.
Planning Problem #8	Providing adequate quality, quantity, and timing of water yields for the benefit of Forest and nonforest uses.
Related Outputs and Activities (See Tables II-5 and II-6)	Snowfence Construction Enhanced Summer Runoff Sediment Increase Riparian Fence Construction Increased Erosion Total Water Yield Water Increase Water Meeting Quality Goals Improved Watershed Condition
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein for the attainment and maintenance of Forest conditions that produce water at a level of quality that meets legal standards. Other direction ensures that favorable instream flows are provided, and that water resource data is collected at levels appropriate to meet management

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements	
Summary of Response (Continued)	information needs, define effects of management, and identify baseline values. Such direction is found under: Range Resource Management; Silvicultural Examination and Prescription; Wilderness Area Managment; Wild and Scenic River Management; Dispersed Recreation Management; Riparian Area Management; Water Uses Management; Water Resource Improvement and Maintenance; Minerals Management; and others. Standards and guidelines that would be applied to all alternatives include those found in management prescription 9A (Riparian Area Management). The opportunity to improve the quantity and timing of water yields from the forest does not vary greatly among alternatives. Alternative E is the exception because of the greatly reduced timber program. The water program is subject in all alternatives to proposals for water developments. Such developments could affect the nature and distribution of other outputs and activities on the forest in varying ways by alternative. Implementation of practices and projects to improve water that does not meet quality goals and to improve watershed condition, is regarded as a minimum to be applied in all alternatives. The cost of the water program varies by alternative in response to the nature and total cumulative impact of activities that could potentially affect water quality to the detriment of associated water uses.
Comparative Response by Alternative	
A (Current Direction - No Action)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve. Such implementation under this alternative would be the most costly (along with Alternative F) of all alternatives because of the intensity and quantity of activities that could cumulatively affect water quality, all of which must be mitigated and monitored to meet legal standards (and quality goals commensurate with use of the water). This alternative would produce the greatest estimated average erosion and sediment. It would produce an estimated average water yield increase 55 percent higher than the current average increase over the planning horizon, and an average sediment increase 10 percent higher.
B (Commodity)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve. Such implementation under this alternative would be nearly as costly as Alternative A because of the intensity and quantity of activities that could cumulatively affect water quality, all of which must be mitigated and monitored to meet legal standards (and quality goals commensurate with use of the water). This alternative would produce slightly less estimated average erosion and sediment then Alternative A. It would produce an estimated average water yield increase 83 percent higher than the current average increase over the planning horizon, and an average sediment increase 3 percent higher.
C (Noncommodity)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality

TABLE II-4 (Continued)

	Comparison of Alternative Responses to Planning Problem Statements
C (Noncommodity) (Continued)	would be expected to improve. Such implementation would be significantly less costly in this alternative compared to current direction due to the limitation on disturbing activities to areas of low risk. Stipulations applied to oil and gas activities to ensure minimum legal water quality standards are met.
	This alternative would produce an estimated average sediment increase 30 percent lower than the current estimated level. It would produce an estimated average water yield increase 40 percent higher than the current average increase over the planning horizon. In selected areas, timber would be harvested with systems designed to increase water yield. Snowfences would be constructed in other selected areas to improve the timing of water yields for late summer range and irrigation purposes.
D (Preferred)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve. Such implementation would be less costly than under Alternative A, but because commodities would be produced at near current levels this change would not be significant. Factors that would tend to minimize the costs, as compared to current direction, are road closures, less open range, and application of oil and gas stipulations to sensitive areas that would lower the risk of water quality impacts.
	This alternative would produce an estimated average sediment increase slightly lower than the current estimated level. It would produce an estimated average water yield increase 49 percent higher than the current average increase over the planning horizon.
E (Reduced Budget)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve, generally. Such implementation would be significantly less costly than under current direction because of the reduction in grazing, timber management and new road construction. Reduced funding could, however, affect basic standards of administration, monitoring and maintenance that would tend to increase the risk of lowered water quality in some areas.
	This alternative would produce the least estimated average erosion and sediment increase. It would produce an estimated average water yield increase 31 percent lower than the current average increase over the planning horizon. Sediment yield would decrease about 68 percent from the current estimated level.
F (RPA)	With implementation of Forest Direction, Management Area Direction standards and guidelines, monitoring activities, and watershed improvement projects, water quality would be expected to improve. Such implementation under this alternative would be the most costly (along with Alternative A) because of the intensity and quantity of activities that could cumulatively affect water quality, all of which must be mitigated and monitored to meet legal standards (and quality goals commensurate with use of the water).
	This alternative would produce slightly less estimated average erosion and sediment than Alternative A. It would produce an estimated average water yield increase 44

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

F (RPA) (Continued)	percent higher than the current average increase over the planning horizon. Sediment yield would increase 4 percent above the current estimated level.
Planning Problem #9	Providing appropriate fire management and protection.
Related Outputs and Activities (See Tables II-5 and II-6)	See PROTECTION in Chapter IV of the DEIS. See also Timber outputs and Wildlife Vegetation Treatment in Tables II-5 and II-6.
Summary of Response	Forest Direction standards and guidelines (Chapter III of the Plan) are applied to all alternatives. Direction is provided therein that provides appropriate fire management and protection, commensurate with the activities proposed under each alternative. Such direction is found under: Wilderness Area Management; Fire Planning and Suppression; Escaped Fire Suppression; Fuel Treatment; Air Resource Management; and Insect and Disease Management/Suppression. Using this direction, specific and appropriate fire management plans are constructed and displayed in Appendix F of the Plan. This planning problem is responded to exclusively by the General Forest Direction and Forest Direction standards and guidelines that are used to develop Appendix F. Opportunities to exercise protection activities would vary by alternative according to variations in timber management, vegetation treatment and roaded access. Insects and diseases are a part of the natural forest environment and would continue to act as agents of change in the ecological process under all alternatives. Tree mortality would continue to occur across the Forest under all alternatives, especially in areas where access, topography or other resource uses preclude treatment. Surveys and monitoring are essential to identify any buildup of insects or disease that would require initiation of suppression measures. The long range goal of insect and disease management is prevention and suppression through silvicultural treatment of susceptible stands. Silvicultural treatments which remove overmature trees and reduce competition due to overstocking, as well as actual removal of infested trees, tend to increase the vigor of the residual trees and increase resistance to insects and disease on lands suitable for timber production. Broadcast burning is not expected to be a major tool in fuel reduction or management of the Forest's timber resource. Methods of fuel reduction associated with timber harvest and public firewood use are available to reduce fuels buildup. Fuels resulting from timber harvesting and timber stand improvement activities will be treated to meet Regional Acceptable Standards under all alternatives. Vegetation treatment creates more diversity in vegetation and less continuous fuel beds. These are both favorable conditions for the control of wildfires. Vegetation treatment methods, particularly the use of prescribed fire, tend to reduce the wildfire hazard for a few years following treatment. The use of prescribed fire does increase the risk of wildfire, but this is mitigated to an acceptable level through proper planning and execution of the prescribed fires. The amount of area receiving

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements	
Summary of Response (Continued)	vegetation treatment will be greatest under Alternative B. Therefore, the beneficial effects on fire protection will be greatest under this alternative. Prescribed fire will continue to be an important tool in wildlife habitat management with treatment of willow and sagebrush, and occasionally aspen. However, since these vegetation types are relatively fire resistant during most of the year, these treatments will not significantly affect the Forest's fire protection program. Law enforcement activities would increase under all alternatives, except E, as more people visit the Forest for recreation or as other management activities increase. Emphasis would be given to the integration of law enforcement with natural resource management to prevent resource losses and protect Forest visitors.
Comparative Response by Alternative	This planning problem is responded to exclusively by the application of Forest Direction that is applied to all alternatives. There are no significant differences in treatment acres or outputs, Forest-wide. Therefore, no discussion is provided for the individual response of each alternative.
Planning Problem #10	Acquisition of rights-of-way, provision for land adjustments, and special uses.
Related Outputs and Activities	See LANDS in Chapter IV of the DIES.
Summary of Response	Forest Direction (Chapter III of the Plan) is applied to all alternatives. Direction is provided therein for conducting the Lands program which includes rights-of-way, land adjustments and special uses. Such direction is found under: Special Use Management; Rights-of-Way and Land Adjustments; and Property Boundary Location. The lands program, including rights-of-way acquisition, will be carried out according to the legal and practical needs of managing other Forest resources, as determined by the implemented alternative. Under all alternatives, there would be permitted special uses of the Forest. Most of these uses would involve relatively small land areas and would have minimal environmental effects. Some special uses would involve larger land areas and would have substantial environmental effects. Environmental analyses will be conducted when any special use is proposed on the Forest. The emphasis of each alternative would directly influence lands-related actions. As commodity outputs increase, the need for support from the lands program is also likely to increase. The Forest's land aquisition and land exchange program needs have been historically limited because of the relatively small amounts of private lands inside the Forest boundary. It is anticipated this will remain true under any of the alternatives considered. Land purchase, acquisition and/or exchange programs would be relatively consistent for all alternatives except E. All alternatives would have a lands program schedule consistent with the Regional Guide and designed to complete priority purchases and acquisitions by the end of the planning horizon. Alternative E would have no program in land purchase or acquisition.

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	The right-of-way acquisition program would have between three and eight acquisitions for all alternatives except E. The program for each alternative would be commensurate with the road and trail construction/reconstruction needs within each alternative. (The 1980 level is five priority acquisitions annually to meet minimum program requirements.) The surveying, marking and posting of land-lines results in the identification and inventory of occupancy trespass encroachments on National Forest lands. This is a relatively small problem on the Shoshone National Forest. The land-line surveying program is expected to remain constant in each of the alternatives except E. Alternatives would not affect utility corridors or water developments. Existing and future considerations of utility corridors come from industry demands for electric transmission lines, communications lines and microwave sites. The demand for energy production would control the continued need for pipelines for the transmission of coal, oil and gas regardless of the selected alternative. The expansion of existing utility corridors and the addition of others would be necessary to accommodate the demand for utilities in all areas of the Forest. Construction of new transportation and utility facilities would be needed to meet increasing demands and to accommodate future needs not anticipated at the time of plan preparation.
Comparative Response by Alternative	This planning problem is responded to exclusively by Forest Direction that is applied to all alternatives. Therefore, no discussion is provided for the individual response of each alternative.
Planning Problem #11	Providing opportunities for mineral exploration, development and extraction at levels compatible with other resource values and uses.
Related Outputs and Activities (See Tables II-5 and II-6)	Nonreserved Areas See MINERALS in Chapter IV of the DEIS.
Summary of Response	Forest Direction (Chapter III of the Plan) is applied to all alternatives. General direction is provided therein for conducting minerals programs to include the objectives and values of other resource programs. Such direction is found under: Wild and Scenic River Management; Visual Resource Management; Wilderness Area Management; Riparian Area Management; Water Resouce Improvement and Maintenance; Minerals Management General; Mining Law Compliance and Admininstration; Minerals Management (Oil, Gas and Geothermal); Minerals Management (Coal, Leasable Uranium and Nonenergy Common Minerals Materials); and Soil Resource Management. Locatable, leaseable and saleable minerals are constrained on a quantitative (i.e., acreage) basis to the same extent in each alternative. The fact that every alternative displays the same acreage (935,000) as available for oil and gas leasing does not mean that the management of this class of minerals activity would be the same in all alternatives. As described in Chapter III of the proposed Forest Plan, every lease application on Forest land is reported to the Bureau of Land Management with

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

Summary of Response (Continued)	attached stipulations tailored to be responsive to the management direction for the analysis area involved. This selection of lease stipulations is very much a site-specific activity, requiring that the stipulations be tailored to actual conditions on the specific lease tract being applied for. The specific lease stipulations available are presented in Chapter III and Appendix E of the Forest Plan. The stipulations selected, and the details specified in these stipulations, will be responsive to the management direction unique to some alternatives. Stipulations would be assigned to leases by using the procedure detailed in Plan Appendix K. All alternatives include stipulations for protecting surface resources at the minimum acceptable level. Alternatives C and D would provide stipulations and more stringent recommended operating standards that protect visual resources at the prevailing visual quality level for selected areas and that reduce the risk of not meeting quality standards for other resources. Inside of wilderness, any mineral activity would have to comply with the provisions of the Wilderness Act of 1964. All alternatives recommend , lease denial in grizzly bear Situation I habitat; outside of wilderness, a one-half mile zone along the interior boundary of Situation 1 areas may be leased on a case-by-case basis with the no-surface-occupancy stipulation.
Comparative Response by Alternative	
A (Current Direction - No Action)	Relatively unrestricted opportunities for oil and gas activities are provided. Oil and gas activities would be conducted with stipulations that insure minimum acceptable standards are met. Areas of high hazard to the soil/water complex (about 534,000 acres) will receive a no-surface-occupancy stipulation on the Forest Service's lease application report to the Bureau of Land Management.
B (Commodity)	Same as Alternative A.
C (Noncommodity)	Oil and gas activities Forest-wide would be conducted with stipulations and more stringent recommended operating standards that are intended to maintain surface resource values at a high level (level above minimally acceptable), which is to reduce the risk of not meeting minimum standards and objectives. Areas of high hazard to the soil/water complex (about 534,000 acres) will receive a no-surface-occupancy stipulation on the Forest Service's lease application report to the Bureau of Land Management. All lease reports will include the package of stipulations and recommended operating standards as detailed in Plan Appendix K. Such measures are necessary to properly emphasize the noncommodity values stressed in this alternative. Oil and gas operations, developments, and facilities would conform to the existing visual quality objective of an area. Oil and gas exploration would be required to depend very heavily upon airlift or nonmotorized access to operations sites to minimize impacts on recreation, watershed and wildlife.
D (Preferred)	Oil and gas activities would be conducted in sensitive or special areas with stipulations and stringent recommended operating standards that are intended to maintain surface resource velues at high levels (levels above minimally acceptable),

TABLE II-4 (Continued)

Comparison of Alternative Responses to Planning Problem Statements

D (Preferred) (Continued)	which is to reduce the risk or not meeting minimum standards and objectives. Selected areas that possess important visual, recreation, wildlife or watershed values would be leased with stipulations and more stringent operating standards (Appendix K of the Plan) that maintain or protect those values. In areas where other commodity values are emphasized, a standard or less restrictive set of stipulations and standards would be applied to leases. Areas of high hazard to the soil/water complex (about 534,000 acres) will receive a no-surface-occupancy stipulation on the Forest Service's lease application report to the Bureau of Land Management.
E (Reduced Budget)	Same as Alternative A. A reduced budget would decrease the effectiveness or quality of administration and monitoring of minerals activities and related facilities.
F (RPA)	Same as Alternative A.

COMPARISON OF ESTIMATED OUTPUTS

Tables II-5 and II-6 summarize selected estimated annual outputs that would result from each alternative. Table II-5 displays values for the first planning period. Table II-6 displays average annual values for the first five planning periods. Values for each RPA planning period are not summarized in this Chapter, but are included in Chapter IV and the planning records. Outputs by planning period for each analysis area were estimated and are included in the planning records. What is summarized here and in Chapter IV is the Forest-wide total of outputs from all analysis areas. Table II-7 displays how outputs from each alternative compare to RPA targets. A discussion of RPA targets is included in Chapter IV under the heading "Conflicts".

Comparison of first decade outputs for current direction with 50-year averages of other alternatives indicates that developed public recreation use will increase in all alternatives except E (reduced budget). Developed private recreation use will also increase in all alternatives above the current level. The sum of all categories of dispersed recreation use, as well as wildlife and fish use, increases in all alternatives above current levels. The increase is greatest for Alternative C, which emphasizes noncommodity values. Over 50 years, all alternatives except E produce more nonwilderness recreation visitor days (RVD's) than the current direction alternative. Wilderness RVD's would be greater in Alternatives C and F, and lower in all other alterantives, in comparison to the current direction alternative.

The range of aspen and sage treatment for wildlife in the alternatives is 277 to 483 acres (50 year average annual). The range found in the benchmarks is 0 to 451 acres; excluding the minimum level benchmark, the range is 185 to 451 acres. The range of wildlife forage produced in the alternatives on summer and winter range is from 50 to 120 thousand cattle animal unit months (MCAUM's). The range found in the benchmarks is 13.7 to 134 MCAUM's. All alternatives would, over 50 years, produce higher average annual quantities of forage for wildlife than current levels. Wildlife forage production is a major emphasis in Alternative C, so available forage is more than doubled. Forage for cattle is greatly reduced in Alternative E, consequently forage available for wildlife would be about three times the current level. Areas where forage is crucial for big game species during the winter are protected at the current, desired level under all alternatives. The range of wildlife outputs found in the alternatives is sufficient to address all issues and concerns, since winter range is the limiting factor and winter range forage is a small fraction of the total wildlife forage produced. All alternatives provide for sufficient wildlife habitat to meet the on-Forest portions of the State's wildlife population objectives by herd unit, except for the Wapiti Ridge Bighorn Sheep Herd Unit (the South Fork population and the North Fork Elk Herd Unit). Alternative A provides for only 40 percent of the habitat required to meet the State's bighorn sheep population objective for the South Fork area. None of the alternatives provide for sufficient habitat for the State's North Fork Elk Herd Unit objective. Reduction or elimination of all domestic livestock grazing on all or portions of the allotments within this herd unit would not be sufficient to meet the State's population objective.

The range of domestic livestock forage produced in the first decade of each alternative is about 36,000 to 88,000 animal unit months. The range found in the benchmarks is 0 to 88,000 animal unit months. Forage for sheep and cattle is made available at higher levels than at present in all alternatives except C and E. Under C, more range is reserved for wildlife and less emphasis is placed on range improvements for cattle. The greatest increase in permitted domestic livestock forage over the planning horizon would occur under Alternative F (RPA). The higher levels of grazing require greater emphasis on range analysis and range improvement activities. The range of domestic livestock forage produced in the alternatives is adequate to address all issues and concerns and is reasonable given the objectives of the alternatives, the market, and cost efficiency considerations.

The range of sawtimber and roundwood output produced by the alternatives in the first decade is 3.0 to 12.9 million board feet. The maximum range of timber outputs produced in the first decade as shown by Benchmark 1 (minimum level) and Benchmark 4 (maximum PNV with nondeclining flow) is 0 to 14.8 million board feet. Average annual timber outputs vary significantly from current levels to those for Alternative E, where the reduced budget dictates the greatest decrease in timber management (see Appendix B). Alternative B harvest is increased by thirty percent. In Alternative C harvest is decreased to meet the amenity emphasis of the alternative. Average annual production of sawtimber, poletimber and fuelwood increases slightly from the present under Alternatives A and D, and decreases slightly under F. The range of timber produced by the alternatives is adequate to address all issues and concerns and is reasonable considering the objectives of the alternatives, the market for timber products, and cost efficiency considerations.

Average annual water yield improvement increases above the current levels in all alternatives except E, where timber harvest is greatly reduced. Alternative C incorporates vegetation and structural treatments specifically to improve water yield and enhance late summer flows. Because of the noncommodity emphasis of Alternative C, timber harvest is deemphasized; therefore water yield is not dramatically increased in that alternative. Yields are greatest in Alternative B where considerable timber is harvested, though not in a manner that is specifically intended to maximize water yield. Water meeting quality goals is assumed to increase over time from the current level with application of improvement techniques in all alternatives. Improvement of watershed condition is regarded as a basic requirement, so the display of water meeting quality goals and improved acres (under soils) does not vary by alternative. A more realistic expectation is that funding in the near future, especially under Alternative E, would not permit the implementation of watershed improvement projects as assumed.

The expected outputs that are displayed here and discussed throughout Chapter IV are contingent upon the implementation of Forest Direction and Management Area standards and guidelines (Plan Chapter III, EIS Appendix G).

TABLE II-5

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for Planning Period 1)

Item	Unit of Measure[1]	Alternatives					
		A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
VEGETATION							
Sage Management - Cattle		.... see RANGE					
Sage Management - Wildlife		.... see WILDLIFE & FISH					
Aspen Management		.... see WILDLIFE & FISH					
Willow Management		.... see WILDLIFE & FISH					
Noxious Weed Treatment		.... see RANGE					
Timber Harvest		.... see TIMBER					
RECREATION							
Developed Public	MRVD	271.	292.	262.	285.	238.	275.
Facility Construction/Reconstruction	M$	147.	169.	108.	153.	86.0	148.
Developed Private	MRVD	151.	151.	151.	151.	148.	151.
Downhill Skiing	MRVD	5.40	5.40	5.40	5.40	5.10	5.40
Dispersed Nonmotorized	MRVD	61.2	81.2	94.5	80.5	51.5	77.3
Dispersed Motorized	MRVD	996.	1,110	1,139.	1,151.	1,056	1,092.
Dispersed Facility Construction/Reconstruction	M$	14.9	12.0	13.7	14.0	7.00	13.0
Wildlife and Fish Use	MWFUD	289.	297.	306.	288.	235.	296.
Primitive Nonwilderness	MACRES	11.8	0.00	5.27	15.3	20.0	11.8
Semiprimitive Nonwilderness Nonmotorized	MACRES	383.	524.	585.	459.	554.	466.
Semiprimitive Motorized	MACRES	352.	231.	153.	301.	229.	275.
Roaded Natural	MACRES	278.	285.	250.	266.	201.	298.
Rural	MACRES	22.9	10.8	10.8	10.8	21.5	10.8
Open to Snowmobiling	MACRES	546.	474.	434.	516.	248.	452.
Restricted Snowmobiling	MACRES	214.	86.0	110.	136.	54.0	116.
Closed to Snowmobiling	MACRES	1,674.	1,873.	1,889.	1,781.	2,110.	1,865.
Restrictions on ORV's	MACRES	364.	218.	225.	261.	130.	208.
Closed to ORV's	MACRES	2,069.	2,216.	2,208	2,172.	2,303.	2,225.
WILDERNESS							
Wilderness Use	MRVD	206.	200.	230.	196.	183.	220.
Pristine Wilderness	MACRES	146.	139.	135.	159.	139.	151.
Primitive Wilderness	MACRES	735.	769.	710.	740.	565.	658.
Semiprimitive Wilderness	MACRES	501.	472.	535.	482.	677.	572.

TABLE II-5 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for Planning Period 1)

Item	Unit of Measure[1]	Alternatives A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
VISUAL MANAGEMENT							
Visuals Rehabilitation and Enhancement	MACRES	2.05	2.05	2.05	2.05	1.2	2.06
Preservation Visual Quality	MACRES	1,386.	1,620.	1,654.	1,582.	1,478.	1,670.
Retention Visual Quality	MACRES	756.	530.	491.	566.	736.	480.
Partial Retention Visual Quality	MACRES	208.	201.	200.	203.	137.	202.
Modification Visual Quality	MACRES	66.1	64.3	70.7	65.6	71.3	65.3
Maxmimum Modification Visual Quality	MACRES	16.8	16.8	16.8	16.8	10.2	16.8
WILDLIFE AND FISH							
Sage Management	ACRES	264.	337.	323.	390.	190.	325.
Aspen Management	ACRES	139.	167.	189.	145.	119.	156.
Willow Management	ACRES	17.5	17.5	6.00	17.5	0.00	17.5
Structural Improvements	MILES	0.30	2.00	0.70	0.50	0.30	2.00
Aquatic Habitat Improvement	M$	0.20	0.20	0.20	0.20	0.20	0.20
Wildlife Forage	MCAUMS	42.1	47.3	71.9	42.9	98.5	44.6
Crucial Preferred Winter Range							
Deer & Elk	MACRES	40.7	40.7	40.7	40.7	40.7	40.7
Moose	MACRES	10.7	10.7	10.7	10.7	10.7	10.77
Bighorn Sheep	MACRES	42.6	42.6	42.6	42.6	42.6	42.6
Mountain Goat	MACRES	0.924	0.924	0.924	0.924	0.924	0.924
Grizzly Bear Situation I	MACRES	412.0	412.0	412.0	412.0	412.0	412.0
Grizzly Bear Situation II	MACRES	819.6	819.6	819.6	819.6	819.6	819.6
Grizzly Bear Situation III	MACRES	17.4	17.4	17.4	17.4	17.4	17.4
Bald Eagle and Peregrine Falcon Habitat	MACRES	29.6	29.6	29.6	29.6	29.6	29.6
RANGE							
Cattle Forage	MCAUMS	76.6	78.6	55.3	78.0	35.3	81.6
Sheep Forage	MSAUMS	35.1	37.9	31.5	25.4	1.70	33.1
Sage Management	ACRES	305.	232.	153.	278.	42.0	218.
Noxious Weed Treatment	ACRES	173.	169.	149.	172.	95.	185.
Range Improvements - Fencing	MILES	3.20	3.40	2.90	3.20	1.00	3.00
Range Improvements - Other	# STRCTRS	5.1	4.70	3.60	5.10	2.40	4.00
Range Suitable and Open	MACRES	272.	256.	204.	260.	80.2	261.

TABLE II-5 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for Planning Period 1)

Item	Unit of Measure[1]	Alternatives A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
TIMBER							
Suitable Acres	MACRES	89.0	106.	71.0	85.4	24.7	82.9
Planting (Reforestation)	ACRES	11.0	139.	0.00	11.0	0.00	0.00
Clearcut Harvest	ACRES	274.	471.	144.	258.	0.00	247.
Seedcut	ACRES	455.	387.	350.	444.	38.0	407.
Overstory Removal	ACRES	375.	399.	375.	367.	282.	395.
Selection Cut[2]	ACRES	966.	1,014	496.	920.	105.	911.
Commercial Thinning	ACRES	246.	347.	298.	285.	445.	235.
Timber Stand Improvement	ACRES	207.	212.	144.	190.	0.00	197.
Sawtimber Harvested	MMBF	10.9	11.9	7.58	10.5	2.68	10.3
Poletimber Harvested	MMBF	0.664	0.98	.0.436	0.680	0.316	0.57
Fuelwood	MMBF	1.27	1.42	.0.881	1.23	0.330	1.19
WATER							
Snowfence Construction	MILES	0.00	0.00	0.20	0.00	0.00	0.00
Total Water Yield	MAF	3,612.	3,612.	3,612.	3,612.	3,611.	3,612.
Enhanced Summer Runoff	MAF	0.00	0.00	0.00	0.00	0.00	0.00
Water Increase	MAF	2.65	2.14	2.63	2.65	1.37	2.65
Sediment Increase	MTONS	24.9	25.3	17.3	24.1	8.00	25.5
Water Meeting Quality Goals	MAF	3,316.	3,316.	3,316.	3,316.	3,316.	3,316.
Riparian Fence Construction	MILES	3.90	3.70	3.10	3.80	1.70	4.3
MINERALS							
Nonreserved Areas	MACRES	935.	935.	935.	935.	935.	935.
SOILS							
Improved Watershed Condition	ACRES	0.00	0.00	0.00	0.00	0.00	0.00
Erosion Increase	MTONS	385.	338.	177.	322.	76.4	330.

TABLE II-5 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for Planning Period 1)

Item	Unit of Measure[1]	Alternatives					
		A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
FACILITIES							
Road Maintenance - Total Miles	MILES	1,477.	1,463.	1,452.	1,467.	960.	1,456.
Road Construction	MILES	7.6	6.6	7.1	6.6	1.0	5.6
Road Reconstruction	MILES	11.2	9.7	10.4	9.7	1.5	8.2
Roads Obliterated	MILES	4.80	4.80	4.80	5.20	2.5	4.8
Roads Closed	MILES	134.	225.	301.	99.0	114.	144.
Roads Controlled	MILES	415.	629.	547.	815.	345.	525.
Roads Open	MILES	941.	607.	608.	578.	500.	683.
FA&O Construction/Reconstruction	M$	8.90	8.90	8.20	8.90	6.1	8.9
Trail Construction/Reconstruction	MILES	3.00	3.00	3.00	3.00	0.70	3.00
Trail Maintenance	MILES	1294.	1297.	1300.	1300.	559.	1,267.

1/ Units of Measure

MRVD = thousands recreation visitor days
M$ = thousands of dollars
MWFUD = thousands of wildlife user days plus thousands of fish user days
MACRES = thousands of acres
MCAUMS = thousands of cattle animal unit months
MSAUMS = thousands of sheep animal unit months
MMBF = millions of board feet
MAF = thousands of acre-feet
MTONS = thousands of tons

2/ Selection cutting is on a twenty year rotation

TABLE II-6

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for 1984-2035)

Item	Unit of Measure[1]	A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
VEGETATION							
Sage Management - Cattle			....	see RANGE			
Sage Management - Wildlife			....	see WILDLIFE & FISH			
Aspen Management			....	see WILDLIFE & FISH			
Willow Management			....	see WILDLIFE & FISH			
Noxious Weed Treatment			....	see RANGE			
Timber Harvest			....	see TIMBER			
RECREATION							
Developed Public	MRVD	298.	312.	283.	309.	255.	296.
Facility Construction and Reconstruction	M$	160.	179.	161.	196.	133.	163.
Developed Private	MRVD	174.	174.	174.	174.	170.	174.
Downhill Skiing	MRVD	6.23	6.23	6.23	6.23	5.90	6.23
Dispersed Nonmotorized	MRVD	99.2	148.	229.	139.	81.0	136.
Dispersed Motorized	MRVD	1,294.	1,406.	1,471.	1,459.	1,350.	1,381.
Dispersed Facility Construction and Reconstruction	M$	4.80	3.94	4.92	4.20	3.00	5.00
Wildlife and Fish Use	MWFUD	289.	297.	306.	287.	235.	296.
Primitive Nonwilderness	MACRES	11.8	0.00	5.27	15.3	20.0	11.8
Semiprimitive Nonwilderness Nonmotorized	MACRES	381.	521.	585.	457.	556.	468.
Semiprimitive Motorized	MACRES	354.	253.	167.	319.	231.	291.
Roaded Natural	MACRES	278.	260.	284.	250.	197.	272.
Rural	MACRES	22.9	10.8	10.8	10.8	21.5	10.8
Open to Snowmobiling	MACRES	546.	474.	446.	517.	242.	452.
Restricted Snowmobiling	MACRES	214.	86.0	110.	136.	54.0	116.
Closed to Snowmobiling	MACRES	1,674.	1,873.	1,877.	1,780.	2,137.	1,865.
Restrictions on ORV's	MACRES	364.	218.	225.	261.	130.	208.
Closed to ORV's	MACRES	2,069.	2,216.	2,208.	2,172.	2,303.	2,225.
WILDERNESS							
Wilderness Use	MRVD	396.	378.	425.	337.	265.	405.
Pristine Wilderness	MACRES	146.	139.	135.	159.	139.	151.
Primitive Wilderness	MACRES	735.	769.	710.	740.	565.	658.
Semiprimitive Wilderness	MACRES	501.	472.	535.	482.	677.	572.

TABLE II-6 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for 1984-2035)

Item	Unit of Measure[1]	Alternatives A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
VISUAL MANAGEMENT							
Visual Rehabilitation and Enhancement	MACRES	1.19	1.19	1.13	1.13	0.655	1.19
Preservation Visual Quality	MACRES	1,422.	1,610.	1,654.	1,589.	1,493.	1,670.
Retention Visual Quality	MACRES	732.	549.	508.	578.	787.	514.
Partial Retention Visual Quality	MACRES	227.	220.	209.	216.	123.	208.
Modification Visual Quality	MACRES	47.5	48.5	56.2	44.7	27.0	35.1
Maxmimum Modification Visual Quality	MACRES	4.55	4.55	4.55	4.55	3.23	4.55
WILDLIFE AND FISH							
Sage Management	ACRES	258.	340.	351.	348.	225.	319.
Aspen Management	ACRES	90.0	98.8	132.	90.2	52.0	87.4
Willow Management	ACRES	28.5	28.2	9.00	28.5	0	28.2
Structural Improvements	MILES	0.12	0.20	0.36	0.16	0.08	0.40
Aquatic Habitat Improvement	M$	0.10	0.10	0.10	0.10	0.10	0.10
Wildlife Forage	MCAUMS	49.7	55.4	84.3	50.4	120.	52.2
Crucial Preferred Winter Range							
Deer & Elk	MACRES	40.7	40.7	40.7	40.7	40.7	40.7
Moose	MACRES	10.7	10.7	10.7	10.7	10.7	10.7
Bighorn Sheep	MACRES	42.6	42.6	42.6	42.6	42.6	42.6
Mountain Goat	MACRES	0.924	0.924	0.924	0.924	0.924	0.924
Grizzly Bear Situation I	MACRES	412.0	412.0	412.0	412.0	412.0	412.0
Grizzly Bear Situation II	MACRES	819.6	819.6	819.6	819.6	819.6	819.6
Grizzly Bear Situation III	MACRES	17.4	17.4	17.4	17.4	17.4	17.4
Bald Eagle and Peregrine Falcon Habitat	MACRES	29.6	29.6	29.6	29.6	29.6	29.6
RANGE							
Cattle Forage	MCAUMS	94.7	96.1	69.1	96.4	41.5	99.8.
Sheep Forage	MSAUMS	40.7	44.7	36.0	30.1	1.90	40.0
Sage Management	ACRES	307.	228.	141.	274.	33.0	218.
Noxious Weed Treatment	ACRES	71.	69.	65.	71.	36.	70.
Range Improvements - Fencing	MILES	0.90	0.90	0.760	0.80	0.20	0.80
Range Improvements - Other	# STRCTRS	1.32	1.24	1.00	1.20	0.40	1.32
Range Suitable and Open	MACRES	272.	256.	204.	260.	80.2	261.

TABLE II-6 (Continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for 1984-2035)

Item	Unit of Measure[1]	Alternatives A Current	 B Commodity Emphasis	 C NonCommodity Emphasis	 D Preferred	 E Reduced Budget	 F RPA
TIMBER							
Suitable Acres	MACRES	89.0	106.	71.0	85.4	24.7	82.9
Planting (Reforestation)	ACRES	9.22	166.	1.00	9.00	2.30	3.60
Clearcut Harvest	ACRES	192.	444.	164.	187.	88.4	180.
Seedcut	ACRES	493.	470.	401.	469.	70.0	445.
Overstory Removal	ACRES	492.	423.	442.	479.	111.	467.
Selection Cut[2]	ACRES	1,213.	1,276.	736.	1,160.	170.	1,155.
Commercial Thinning	ACRES	133.	137.	132.	141.	208.	129.
Timber Stand Improvement	ACRES	150.	196.	131	146.	80.0	142.
Sawtimber Harvested	MMBF	11.2	12.1	8.63	10.7	2.84	10.4
Poletimber Harvested	MMBF	0.554	0.76	0.375	0.529	0.159	0.54
Fuelwood	MMBF	1.34	1.42	0.991	1.24	0.330	1.21
WATER							
Snowfence Construction	MILES	0.00	0.00	0.26	0.00	0.00	0.00
Total Water Yield	MAF	3,614.	3,614.	3,613.	3,613.	3,611.	3,614.
Enhanced Summer Runoff	MAF	0.00	0.00	0.563	0.00	0.00	0.00
Water Increase	MAF	4.14	4.91	3.77	3.99	1.85	3.87
Sediment Increase	MTONS	32.8	32.1	21.2	28.7	8.00	30.1
Water Meeting Quality Goals	MAF	3,450.	3,450.	3,450.	3,450.	3,450.	3,450.
Riparian Fence Construction	MILES	1.86	1.74	1.66	2.00	0.98	1.94
MINERALS							
Nonreserved Areas	MACRES	935.	935.	935.	935.	935.	935.
SOILS							
Improved Watershed Condition	ACRES	4,020	4,020	4,020	4,020	4,020	4,020
Erosion Increase	MTONS	385.	338.	177.	322.	76.4	330.

TABLE II-6 (continued)

Summary Comparison of Outputs, Effects and Activities by Alternative (Average Annual for 1984-2035)

Item	Unit of Measure[1]	Alternatives A Current	 B Commodity Emphasis	 C NonCommodity Emphasis	 D Preferred	 E Reduced Budget	 F RPA
FACILITIES							
Road Maintenance - Total Miles	MILES	1,614.	1,552.	1,563.	1,568.	1,040	1,554.
Road Construction	MILES	5.2	4.8	3.6	4.6	1.0	4.0
Road Reconstruction	MILES	8.4	7.8	5.9	7.5	1.6	6.5
Roads Obliterated	MILES	0.20	1.78	1.78	2.00	0.96	1.78
Roads Closed	MILES	102.	261.	325.	102.	120.	142.
Roads Controlled	MILES	873.	655.	585.	853.	376.	633.
Roads Open	MILES	660.	637.	652.	640.	465.	768.
FA&O Construction and Reconstruction	M$	8.86	8.86	8.44	10.0	7.18	8.86
Trail Construction/Reconstruction	MILES	3.00	2.80	2.80	3.00	1.36	3.00
Trail Maintenance	MILES	1,363.	1,330.	1,362.	1,364.	588.	1,330.

1/ Units of Measure

MRVD = thousand recreation visitor days
M$ = thousands of dollars
MWFUD = thousands of wildlife user days plus thousands of fish user days
MCAUMS = thousands of cattle animal unit months
MSAUMS = thousands of sheep animal unit months
MMBF = millions of board feet
MAF = thousands of acre-feet
MTONS = thousands of tons

2/ Selection cutting is on a twenty year rotation

TABLE II-7

Production Capacity by Alternative Compared to RPA Objectives Assigned to the Forest (Average Annual Units)

Output	Alternative or RPA Objective	Unit of Measure	Planning Period				
			1	2	3	4	5
Recreation							
Developed	Current (Alt. A)	Thousand Visitor Days	428.	458.	482.	502.	519.
	Commodity (Alt. B)		449.	472.	495.	515.	532.
	Noncommodity (Alt. C)		419.	442.	466.	486.	502.
	Preferred (Alt. D)		441.	469.	493.	512.	530.
	Reduced Budget (Alt. E)		391.	412.	432.	450.	467.
	RPA (Alt. F)		432.	455.	479.	499.	516.
	Regional Objectives Assigned to Forest		500.	500.	600.	700.	800.
Dispersed (Includes Nonwilderness, Wilderness, and Wildlife and Fish use)	Current (Alt. A)	Thousand Visitor Days	1551.	1750.	1983.	2321.	2778.
	Commodity (Alt. B)		1687.	1867.	2099.	2604.	2885.
	Noncommodity (Alt. C)		1771.	1991.	2263.	2845.	3287.
	Preferred (Alt. D)		1714.	1904.	2136.	2461.	2892.
	Reduced Budget (Alt. E)		1481.	1644.	1825.	2259.	2450.
	RPA (Alt. F)		1684.	1860.	2090.	2591.	2864.
	Regional Objectives Assigned to Forest		700.	800.	1100.	1100.	1100.

TABLE II-7 (continued)

Production Capacity by Alternative Compared to RPA Objectives Assigned to the Forest (Average Annual Units)

Output	Alternative or RPA Objective	Unit of Measure	Planning Period 1	2	3	4	5
Wildlife							
Wildlife Habitat Improvement	Current (Alt. A)	Acres	420.	445.	402.	274.	340.
	Commodity (Alt. B)		522.	532.	499.	363.	420.
	Noncommodity (Alt. C)		517.	510.	529.	331.	432.
	Preferred (Alt. D)		552.	478.	523.	325.	455.
	Reduced Budget (Alt. E)		308.	296.	309.	210.	262.
	RPA (Alt. F)		499.	470.	481.	318.	407.
	Regional Objectives Assigned to Forest		16,000	14,000	10,000	6,000	6,000
Range							
Grazing Use	Current (Alt. A)	Thousand Animal Unit Months	83.6	83.6	112.	117.	117.
	Commodity (Alt. B)		86.1	86.1	114.	119.	119.
	Noncommodity (Alt. C)		61.6	61.6	83.2	87.7	87.7
	Preferred (Alt. D)		83.1	83.1	112.	117.	117.
	Reduced Budget (Alt. E)		35.6	35.6	45.0	46.7	46.7
	RPA (Alt. F)		88.2	88.2	117.	123.	123.
	Regional Objectives Assigned to Forest		87.	87.	88.	88.	88.

TABLE II-7 (continued)

Production Capacity by Alternative Compared to RPA Objectives Assigned to the Forest (Average Annual Units)

Output	Alternative or RPA Objective	Unit of Measure	Planning Period 1	2	3	4	5
Timber							
Allowable Sale Quantity (Includes Sawtimber and Roundwood)	Current (Alt. A)	Million Board Feet	11.5	11.5	11.9	11.9	11.9
	Commodity (Alt. B)		12.9	12.9	12.9	12.9	12.9
	Noncommodity (Alt. C)		8.0	9.3	9.3	9.3	9.3
	Preferred (Alt. D)		11.2	11.2	11.3	11.3	11.3
	Reduced Budget (Alt. E)		3.0	3.0	3.0	3.0	3.0
	RPA (Alt. F)		10.8	11.1	11.0	11.0	11.0
	Regional Objectives Assigned to Forest		10.0	11.0	11.0	11.0	11.0
Water							
Water Meeting Quality Goals	Current (Alt. A)	Million Acre-Feet	3.316	3.390	3.465	3.539	3.539
	Commodity (Alt. B)		3.316	3.390	3.465	3.539	3.539
	Noncommodity (Alt. C)		3.316	3.390	3.465	3.539	3.539
	Preferred (Alt. D)		3.316	3.390	3.465	3.539	3.539
	Reduced Budget (Alt. E)		3.316	3.390	3.465	3.539	3.539
	RPA (Alt. F)		3.316	3.390	3.465	3.539	3.539
	Regional Objectives Assigned to Forest		2.95	3.05	3.10	3.10	3.10

COMPARISON OF EFFECTS

Physical and Biological Effects

Table II-8 summarizes selected physical and biological effects that would likely occur under each alternative. Different types of environmental factors are displayed using different types of comparison. Recreation and visual resource effects are best viewed by considering the current condition versus the resultant condition in the fifth decade of Forest Plan implementation for each alternative. Some water and soil effects are variable over time because land disturbances vary over time, and recovery rates for each type of disturbance must be considered. These effects are best viewed by considering the current annual impact versus the average annual impact over the fifty year period. Other effects can be disclosed only in a narrative, rather than a quantitative, fashion. These effects are noted by displaying an increase or decrease from the current trend.

Values for each RPA planning period are not summarized in this chapter, but are included in Chapter IV and the planning records. Physical and biological effects by planning period for all analysis areas were estimated and are included in the planning records. What is summarized here and in Chapter IV is the Forest-wide total of physical and biological effects on each analysis area. Detailed descriptions of program outputs and physical and biological effects through time are presented in Chapter IV, Environmental Consequences.

The effect of management on physical and biological recources from the Forest-wide standpoint is minor. From the standpoint of individual analysis areas and local issues and concerns, the effects could be significant. Some adverse effects of management though local, could be long term, irreversible or irretrievable if not mitigated by standards and guidelines included in the Plan.

The effects on wilderness recreation involve shifts in the opportunities provided by alternative. By the last decade, increases in pristine wilderness would be significant under Alternatives C and D, and about the same level as current in the other alternatives. Primitive wilderness would increase significantly in Alternative B, decrease significantly in the preferred Alternative D, and decrease greatly in Alternative E. The large decrease is expected because of lack of funds to administer standards associated with primitive wilderness, which would consequently become semiprimitive.

Nonmotorized recreation opportunities outside of wilderness would greatly increase in Alternatives C and E. The amenity emphasis in C is concurrent with a deemphasis on road-related forms of recreation. In Alternative E, funding would reduce the timber management program and the number of roads associated with it. The areas available for motorized recreation do not increase significantly in any alternative.

The number of areas in the visual quality category of preservation would increase significantly in Alternative D and greatly in C. Most of this change is accounted for by decreases in the retention category. There is a general shift in these two alternatives of acres into a less obtrusive visual quality objective than exists at present. Acres of maximum modification and modification visual quality decrease from present levels in all alternatives due to visual rehabilitation occurring in the first decade.

Acres of wildlife habitat improvement increases from current direction levels in Alternatives C and D and decreases greatly in all others. Such treatments are not expected to reduce the limiting factors presently existing in wildlife habitat, but to increase the quality of habitat in selected areas. Acres of crucial preferred winter range for various species is protected in all alternatives (see Tables II-5 and II-6). Similarly, areas of grizzly bear situation 1 habitat are protected in all alternatives, as are areas of other T and E and unique species. Special measures designed to accelerate the recovery of the grizzly bear population are applied in Alternatives B, C and F. Populations of indicator species are not expected to change significantly from there current levels.

All alternatives produce water increases and, consequently, sediment yield increases. None of the alternatives are expected to produce annual average increases in water or sediment (over the planning horizon) as great as the current estimated levels. Alternative E produces the least in either category due to the large reduction in timber harvest (and associated road construction) and grazing use from current levels. The values for average water and sediment yield increase by alternative shown in Table II-8 should be viewed as an index of comparison between alternatives over time. Computation of sediment increases involves only an estimate or an index based upon roads, vegetation management, and domestic grazing. There is insufficient data available to estimate potential sediment yields from oil and gas development activities; therefore the table does not reflect any potential increases from that source. Sediment yields decrease in Alternatives C, D and E and remain nearly the same in the others. The large decrease in C is associated with de-emphasis on all activities that produce sediment such as livestock grazing, timber harvest and road construction and use, in accordance with the emphasis on high water quality. The yield decreases in E simply because of budgetary limitations on engaging in such activities. Increases in potential sources of pollution, both concentrated and dispersed, cause an increased risk of cumulative impacts on water quality, wetlands and floodplains. These risks are associated with commodity production and road densities over the current trend. The risk would decrease in all alternatives because of lower commodity production and because of the application of more stringent restrictions on oil and gas operations in Alternatives C and D.

Effects on the Forest's transportation system increase or decrease relative to the number of recreation visitor days of expected use compared to the present level. The physical degradation of roads is expected to increase in Alternatives B, C and D and decrease in E and F. Wear on trails is expected to increase with use in Alternatives B and C and decrease in D and E.

The risk of significant changes in air quality from on-Forest activities is expected to occur only with oil and gas development and production. While all alternatives provide for protection of air quality, the application of more stringent recommended operating precedures in Alternatives C and D would, in effect, decrease the risk of changes in air quality due to pollution sources associated with oil and gas facilities on the Forest.

The expected effects that are displayed here and discussed throughout Chapter IV are contingent upon the implementation of Forest Direction and Management Area Prescription standards and guidelines (Chapter III, Plan). Management Area Prescriptions are applied differently in each alternative.

TABLE II-8

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	 B Commodity Emphasis	 C Noncommodity Emphasis	 D Preferred	 E Reduced Budget	 F RPA
VEGETATION								
Conifer Cover Type	Percent of Total Conifer Acreage 1/							
0-20 age class		21	9	14	8	8	2	8
20-40 age class		0	9	14	9	8	2	8
40-60 age class		0	15	16	14	15	10	15
60-80 age class		0	11	10	10	14	10	10
80-100 age class		3	0	0	0	1	0	0
100-120 age class		9	0	0	0	0	0	0
120-140 age class		0	2	0	1	1	1	2
140+ age class		45	32	24	36	32	53	35
All Age		22	22	22	22	22	22	22
Aspen Cover Type	Percent of Total Treatable Aspen Cover Type which is under Periodic Treatment	NA	70	76	74	70	40	68
Sagebrush Cover Type	Percent of Total Treatable Sagebrush Cover Type which is under Periodic Treatment	NA	33	34	30	37	16	32
Riparian Cover Type	Percent of Total Riparian Cover Type which is Managed	NA	All riparian cover type is managed with standards and guidelines in all alternatives.					

TABLE II-8 (Continued)

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
RECREATION								
Primitive Nonwilderness	MACRES 1/	12	12	0	5	15	20	12
Semiprimitive Nonmotorized Nonwilderness	MACRES 1/	360	381	521	585	457	556	468
Semiprimitive Motorized	MACRES 1/	348	354	253	167	319	230	291
Roaded Natural	MACRES 1/	281	278	260	284	250	197	272
Rural	MACRES 1/	23	23	11	11	11	22	11
VISUAL								
Preservation VQO 2/	MACRES 1/	1413	1422	1610	1654	1589	1493	1670
Retention VQO	MACRES 1/	742	732	549	508	578	787	514
Partial Retention VQO	MACRES 1/	201	227	220	209	216	123	208
Modification VQO	MACRES 1/	63.2	47.5	48.5	56	44	27	35
Maximum Modification VQO	MACRES 1/	16.5	1.5	1.5	1.5	1.5	1.5	1.5
WILDERNESS								
Pristine Wilderness	MACRES 1/	138	146	139	135	159	139	151
Primitive Wilderness	MACRES 1/	714	735	769	710	740	565	658
Semiprimitive Wilderness	MACRES 1/	556	501	472	535	482	677	572
WILDLIFE								
Direct Habitat Improvement	ACRES/YR 3/	NA	376	467	492	467	277	434
WATER								
Water Yield Increase	AC-FT/YR 3/	2690	4150	4910	3770	4000	1850	3870
Sediment Yield Increase	MTONS/YR 3/	24.9	27.5	25.6	17.6	24.5	8.04	25.8
Water Quality, Wetlands, and Floodplains	Net change in risk of cumulative effects from current	NA	No Change	Decrease	Decrease	Decrease	Decrease	Decrease
	Relative risk of cumulative effects	NA	Very High	High	Very Low	Moderate	Low	High

TABLE II-8 (Continued)

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
SOILS								
Erosion Increase	MTONS/YR 3/	399	385	338	177	322	76	330
FACILITIES								
Roads	Net change in wear from current trend	NA	No Change	Increase	Increase	Increase	Decrease	Decrease
Trails	Net change in wear from current trend	NA	No Change	Increase	Increase	Decrease	Decrease	No Change
AIR								
Air Quality	Net change in risk of air pollution from current trend	NA	No Change	No Change	Decrease	Decrease	No Change	No Change

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1/ at the end of fifty years, MACRES = thousand acres

2/ VQO = visual quality objectives

3/ average annual over fifty years, MTONS = thousand tons

Economic Effects

Economic analysis plays a major role in developing a Forest Plan. This includes both cost efficiency analysis and economic impact analysis. Cost efficiency analysis is the analysis prescribed in the NFMA regulations to deal with efficiency questions (see Appendix B under the heading EFFECIENCY ANALYSIS and 36 CFR 219.12(b)(f)(g)(h)). Economic impact analysis is the estimation of effects of different alternatives on local economies and population. It is discussed below under the heading Economic Impact Analysis.

Cost Efficiency Analysis

For cost efficiency analysis, inputs in the form of practices included in FORPLAN prescriptions are assigned a cost. Assignments of costs were based on past experience of staff in the Supervisor's Office and District personnel as to what it costs to do each practice under various field conditions and standards. Costs were assigned to practices based on the standards included in a specific FORPLAN prescription and the characteristics of the analysis area for which that FORPLAN prescription was developed.

Cost efficiency analysis was done for all prescriptions, benchmarks, and alternatives using FORPLAN models. Present net value (PNV) was the indicator used to measure cost efficiency. Present net value is defined as discounted benefits minus discounted costs. Over 70 catagories of benefits were included in FORPLAN and most were assigned an economic value. For market outputs of timber, range, and developed recreation, data from past experiences on the Forest were used to assign a benefit value. This was done by Regional Office staff and the Economic Research Service of the Department of Agriculture using data gathered from the Forest. For nonmarket goods and services such as dispersed recreation, hunting, fishing, and water, a willingness-to-pay value was calculated by the Washington Office (RPA) for use on the Forest. Calculation of willingness-to-pay values for oil and gas leases were done on the Forest using the procedures discussed in Appendix D. The values for oil and gas leasing were estimated using an experimental procedure. These values were not used in calculating PNV for the alternatives. However, results of this analysis and effects on PNV's for the alternatives are presented in Appendix D. All of the benefit values were represented in FORPLAN prescriptions based on how the practices and associated standards would effect production of each good or service on the analysis area for which a prescription was developed.

Cost efficiency analysis was done using a four percent discount rate. All costs and benefit values were in 1982 dollars. No real cost or benefit increases or decreases were used in analysis. All costs and benefits used in cost efficiency analysis were included in FORPLAN. The only cost not included was right-of-way acquisition costs. These were added by alternative based on the management strategies chosen for that alternative and the rights-of-way necessary for accomplishing those strategies.

Cost Efficiency Effects

Present net value (PNV) is the measure of cost efficiency used in forest planning. It is defined as the difference between the discounted dollar value of all priced outputs and the discounted value of all expenditures for management and investment. The process of discounting expresses all values at a common date. A large PNV indicates that the public, as owners of the

National Forest, could realize a large net return from their investment. A smaller PNV indicates a smaller net return could be realized.

The intent of Forest Planning is to select an alternative which will maximize the benefit to the American public through management of the Forest. PNV is an important component or effect that is included in net public benefits. Because it includes the costs to taxpayers of producing all benefits, the real returns to the treasury associated with producing market-valued outputs, and the estimated worth of nonmarket-valued outputs, it provides a means of examining differences between alternatives.

Two kinds of prices were used in calculation of PNV. These relate to goods and services that have a market such as timber; and goods and services which are not normally traded in a market such as hiking, horseback riding, or viewing wildlife. For the first type of good or service, data on actual transactions on the Forest are used to calculate a price or benefit value used in analysis. For the second type of good or service, a "willingness-to-pay" value was calculated (see Appendix B for a more detailed discussion). In this way, an economic value is used in analysis to represent production levels of most goods and services.

Prices have not been assigned to all benefits, nor have methodologies for including all benefits in modeling been developed. It is primarily the desire or need of producing such nonpriced benefits that would cause selection of a alternative with a lower PNV than the maximum. Such nonpriced benefits include certain outputs, such as threatened and endangered species; certain physical conditions such as areas with high quality scenery; certain distributional effects, such as where the high quality scenery or wildlife winter range is located; certain reductions in risk, such as species and age distribution control for insect and disease management; and social and economic impact considerations.

Beyond these goods and services not valued in analysis, there is often an inability to distinguish various quality levels directly in economic efficiency analysis. This is particularly important when evaluating such things as the wildlife habitat or recreation opportunities provided by an alternative. In such instances, production levels between alternatives may vary little; however, because of standards and guidelines used in that production, quality of outputs can vary greatly.

The future value to society of Shoshone National Forest will depend upon the mix of economic and other values that are produced, the quality of those values, the costs of managing the Forest to produce those values, and the way society is affected. The trade-off between goods and services (recreation versus timber production, for example) is not a simple comparison between production levels of two or more outputs. This is because production of an individual good or service is not independent of production of other goods or services. For example, depending on the standards used to lay out timber sales, they can have either a beneficial or negative effect on wildlife. Large cut blocks are less expensive to prepare and to cut, but provide low quality edge for wildlife. Cut blocks of 25 to 35 acres with edges that provide security cover for wildlife can have a very beneficial efffect on the same species of wildlife while costing more from both a preparation and harvest standpoint. Following this logic, the trade-off is really between the forest conditions created by management and the mix of goods and services produced by those forest conditions, not between production levels of one output versus levels of another.

Formulation and analysis of alternatives on the Forest focused on alternative forest conditions by major ecosystem type (forested ecosystem, sagebrush grassland ecosystem, or aquatic ecosystems). The forest conditions modeled and used to build alternatives were designed to resolve sets of issues, concerns, and opportunites identified throughout the planning effort. (A more complete discussion of this process is included in Appendix B.) This means that a simple discussion of output level trade-offs or of economic indicators provides an incomplete picture of the real differences between alternatives. Even though this is true, such discussions are presented as part of the overall discussion of differences between alternatives.

As an example, examine the differences between Alternatives C and D, particularly in the area of timber harvest. A common belief is that timber harvest is detrimental to wildlife and therefore an alternative that harvests less timber is better from a wildlife standpoint. Effects on wildlife, though, are not as much of a function of how much is harvested but rather how and where such harvest is to take place. Further, as a side issue, wildlife is very much affected by the amount of roads left open for public use in such harvest areas. Comparisons between these alternatives from a timber versus wildlife standpoint therefore would require an examination of: the standards for harvesting, the types of forest conditions that would be achieved through such harvest, existing cover to forage ratios in areas where harvest is planned, and how roads used to support timber harvest will be managed in terms of public use. In the case of current conditions on the Forest, commercial timber cover often exists in large blocks between summer and winter ranges for such species as deer and elk. Further, the current age distribution is skewed toward mature to over mature timber providing poor cover-to-forage ratios and low quality edge. Given that standards for harvest require cut blocks no larger than 40 acres surrounded by cover, and that all roads built exclusively for timber harvest are to be closed to public access, greater benefits to wildlife can result from higher timber harvests. A simple one to one trade-off comparison between alternatives would tend to favor Alternative C, while more detailed examination shows that alternative D provides better edge and structural diversity for wildlife. Thus, simple trade-off comparisons, though important and of interest, provide only partial information when comparing alternative management strategies for complex ecosystems.

Each alternative was developed to address a set of issues and concerns efficiently. This was done through design and analysis of alternative forest conditions that could be achieved throughout the Forest. As such, each alternative provides a different mix or pattern of outputs and a different set of environmental, economic and social effects. This section discusses patterns of differences in economic effects.

Commodities which generate revenue to the treasury include timber, grazing of domestic livestock and developed recreation, including outfitters and guides (for analysis purposes the National Outdoor Leadership School in Lander was included as an outfitter and guide). Income and economic benefits from production of these goods and services comprise a small portion of the total economic benefit. In general, however, those alternatives which produce more of these commodities have higher PNV's. Primary reasons for this include the relatively small proportion of the Forest that can produce commercial crops of trees or be used by domestic livestock, coupled with a relatively low demand for recreation. With 57 percent of the Forest designated as wilderness and 85 percent of the Forest unroaded, capacity for all forms of recreation except developed recreation are far in excess of that which could be consumed. All alternatives provide for enough capacity to meet all demands for recreation. Thus the economic efficiency value of recreation production varies little if at all between alternatives. This, plus the fact that costs of production for timber and grazing of domestic livestock are exceeded by the benefits produced by these actitivities in all alternatives, account for the general trend of higher PNVs associated with higher production levels of commodities.

Differences between alternatives in terms of PNV, benefits produced, and costs incurred are illustrated in Tables II-9, II-10, and II-11. Tables II-9 and II-10 display alternatives in order of decreasing PNV. Table II-9 provides detail on incremental changes between alternatives in total discounted costs and total discounted benefits. Table II-10 provides more detail in terms of the contribution to costs and benefits attributed to various classifications of goods and services. Table II-11 provides detail on the distribution of costs in terms of fixed costs, investments, operations costs, and costs incurred by Forest users in production of goods and services.

The benchmark which maximizes PNV is also displayed in these tables to provide a basis for comparing each alternative with costs, benefits, and PNV which would result from managing the Forest from a maximum cost efficiency standpoint. Because only production levels and not quality of outputs are measured in economic efficiency, and because production levels of outputs are similar in all alternatives, ranking by PNV follows ranking by total discounted cost fairly closely. This is true except for alternatives C and E which de-emphasize production of commodities. Costs for these alternatives are lower than all other alternatives. The losses to total discounted benefits, because of much lower timber harvest levels and grazing of domestic livestock in these alternatives, exceed decreases in costs. As stated earlier, this is due in part to the fact that benefits from timber and range programs generally exceed their costs on the Forest.

The differences between alternatives, and even the ranking of alternatives, would be different and more extreme if economic costs and benefits of mineral development were included. Not shown in these or subsequent tables is the approximately $1.1 million generated annually from current oil and gas leases on the Forest. Income from these leases is collected by the Bureau of Land Management and was not used in the calculation of total discounted benefits. Further, this income to the U.S. treasury exceeds all other revenues generated on this Forest. Because the Plan does not affect current leases and because all alternatives provide the same number of acres available for leasing, the income generated through lease fees in all alternatives would be the same.

There are no geological structures for oil and gas production that have been proven on the Forest. Because of this, there was no attempt to estimate possible production levels of oil and gas and the revenues to the treasury and State of Wyoming that would be generated by such production. However, to include oil and gas considerations in analysis and to display relative differences between alternatives, a method for estimating the lease bid values by alternative was developed and used. This analysis procedure and results of the procedure are displayed in Appendix D. In short, this procedure attempted to estimate the value of leases based on the stipulations and operating standards that would be recommended under each alternative (see minerals discussion in Chapter IV and Appendix D for more detail).

TABLE II-9

Comparison of Present Net Value, Discounted Costs, and Discounted Benefits* (Billions of Dollars)

Benchmark or Alternative	PNV	Incremental Change in PNV	Discounted Cost	Incremental Change in Discounted Costs	Discounted Benefits	Incremental Change inal Discounted Benefits	Benefit Cost Ratio
Max PNV	419.1	--	102.9	--	522.	--	5.07
F RPA	418.92	-0.18	103.98	+1.08	522.9	+0.9	5.03
B Commodity Emphasis	416.6	-2.32	109.1	+5.12	525.7	+2.8	4.82
D Preferred	409.3	-7.3	107.6	-1.5	516.9	-8.8	4.80
A Current Direction	407.1	-2.2	110.9	+3.3	518.	+1.1	4.67
C Noncommodity Emphasis	406.8	-0.3	103.2	-7.7	510.	-8.0	4.94
E Reduced Budget	394.	-12.8	48.5	-54.7	442.5	-67.5	9.12

* All values are presented as incremental above minimum level management benchmark values.

TABLE II-10

Comparison of Present Net Value, Discounted Benefits, and Discounted Costs by Resource Area (Billions of Dollars)[1]

Benchmark or Alternative	PNV	Recreation Benefits	Range Benefits	Timber Benefits	Water Benefits	Returns to Treasury	Recreation Costs		Roads & Facilities Costs		Timber Costs	Wildlife Costs	Range Costs
							Facilities & Trails Maintenance	Operation and Administration	Construction and Reconstruction	Operation and Maintenance			
Max PNV	419.1	469.8	22.78	12.61	3.94	18.77	23.81	6.03	8.61	13.07	6.08	1.92	1.03
F RPA	418.9	469.8	23.19	12.88	3.95	19.10	24.68	6.05	8.50	13.05	6.22	1.97	1.06
B Commodity Emphasis	416.6	469.8	22.60	15.19	5.00	21.31	25.16	5.55	10.35	13.03	9.18	2.05	1.04
D Preferred	409.3	468.9	21.96	13.25	4.06	19.27	25.15	5.48	10.13	13.90	6.44	1.97	1.13
A Current Direction	407.1	468.8	22.07	13.75	4.18	19.79	26.44	5.62	12.14	14.14	6.66	1.90	1.16
C Noncommodity Emphasis	406.8	469.8	16.34	10.54	3.51	15.70	25.58	5.64	8.55	12.92	4.97	2.05	0.84
E Reduced Budget	394.0	419.2	9.07	3.57	2.02	7.45	17.29	2.33	3.09	8.28	1.98	1.11	0.40

1/ All values are presented as incremental above minimum level benchmark values. Costs and benefits by resource area do not account for total costs and benefits. Some resource costs and benefits such as those associated with soil, water, and air are not shown, nor are fixed costs of running the Forest. Costs by resource area represent variable cost above fixed costs. Fixed costs varied insignificantly by alternative. Caution must be used in comparing resource area costs and benefits because costs attributed to one area provide benefits to other areas; for example costs incurred to increase range conditions produce more forage for both domestic livestock and wildlife. Benefits to wildlife are included in recreation benefits through increases in hunting and wildlife viewing caused by improving wildlife habitat. Returns to treasury are moneys collected through the sale of timber, grazing fees, and fees charged for developed recreation and special uses. Benefits include all such moneys as well as estimates of the value to the public of nonmarket goods and services such as dispersed recreation. Fees from mineral leasing are not included in either returns to treasury or benefits.

Table II-11

Summary All Periods Discounted Benefits and Cost (Millions of First Quarter 1982 Dollars, 4% Discount Rate)[1]

	Benchmarks		Alteratives					
	#1 Minimum Level	#4 PNV M+A[2]	A Current	B Commodity Emphasis	C NnCmmdty Emphasis	D Preferred	E Reduced Budget	F RPA
Benefits								
Assigned Values	4089	490.4	489	491.3	484.5	488.9	426.5	490.7
Federal Receipts	0	18.8	19.8	21.3	15.7	19.3	7.4	19.1
Total Benefits	4089	509.2	508.8	512.6	500.2	508.2	433.9	509.8
Costs								
General Admin & Long-term fixed	8.65	31.6	31.7	32.1	31.4	31.7	8.82	31.7
Investment	0	14.8	18.8	17.2	15.3	17.3	7.58	15.1
Operational	0.25	41.9	49.2	44.9	45.3	47.8	22.7	42.15
Total Forest Service Cost	8.9	88.2	99.7	94.2	91.95	96.8	39.12	88.95
Non-Forest Service Cost	0	1.87	2.04	1.84	1.45	2.11	0.78	1.95
Total Cost	8.9	90.1	101.7	96	93.4	98.9	39.9	90.9
Present Net Value								
Present Net Value	4080	419.1	407.1	416.6	406.8	409.3	394	418.9
Benefit/Cost Ratio								
Benefit/Cost Ratio	459	5.65	5.0	5.34	5.36	5.14	10.87	5.6

1/ values for Benchmark #4 and alternatives are incremental from Benchmark #1
2/ market plus assigned values

The valuation analysis shows that all alternatives except C and D result in lease values at or near their maximum. Of the remaining two, alternative D is significantly higher than C. If added into the total PNV calculations, ranking of alternatives would change somewhat. In this case, Alternative A would follow the commodity alternative and its PNV would be greater than the preferred alternative. Next would follow the preferred alternative and then much further behind would be Alternatives E and C.

The reason for this result in terms of the value of leases is due to the stipulations and operating standards that would probably be recommended for oil and gas exploration and development. This is an illustration of a point discussed earlier. The quantified measure of areas available for leasing remains the same for all alternatives. This could be interpreted as if oil and gas leasing and production were either ignored in planning or were of such a significance that they overrode all other values. Neither was the case. It appeared that there was little legal justification for excluding oil and gas leasing on any portion of the acres available, assuming that a no-surface-occupancy stipulation would provide sufficient opportunity for the leasee. However, there are reasons for controlling such leasing and development so that each can be done in harmony with management of other resource values within each alternative. This is accomplished through application of alternative sets of stipulations and probable operating standards. Comparing quantitative measures for alternatives does not adequately display these differences.

Comparison of Alternatives in Terms of Net Cash Flow

A ranking of alternatives in terms of net cash flow, showing cash receipts and noncash benefits, is shown in Table II-12. Net cash flow was calculated by subtracting cash receipts estimated for each alternative from the total budget cost of each alternative. The ranking of alternatives in this way is much different than ranking them by PNV. Further, the relationship between market and nonmarket production possibilities on this Forest is illustrated.

Cash receipts to the Forest, shown in Table II-14, include stumpage prices paid for timber, grazing fees from domestic livestock use on the Forest, and fees charged for developed recreation (including fees paid by commercial operators, including lodges and outfitters and guides). Lease fees for oil and gas were not included because these fees are not collected by the Forest and as such are not part of the cash flow of the Forest. Of the fees charged, only those for timber represent the full dollar value to the American public of these outputs. Grazing fees, set by Congress, represent the difference between the full value to the public of grazing and costs incurred by permittees. To account for that in analysis, the difference between fees charged and the total value to the American public were included in analysis as part of the nonmarket production benefits. Similarly, fees charged for developed recreation fall short of the total value to the American public of these outputs. These values were included as part of the nonmarket production benefits. Nonmarket production benefits also included benefits derived from dispersed nonwilderness recreation, wilderness recreation, hunting, fishing, and production of water above that which would be produced naturally. The ability of the Forest to produce market outputs is very limited. Only about 6 percent of the Forest is capable of growing commercial crops of trees and of that, only 3 to 4 percent can produce timber in an economically efficient manner. Similarly, only about

TABLE II-12

Ranking of Alternatives By Net Cash Flow (Millions of Dollars)

Alternative	First Decade				Fifth Decade			
	Net Cash Flow	Total Cost*	Cash Receipts**	Nonpriced Benefits***	Net Cash Flow	Total Cost*	Cash Receipts**	Nonpriced Benefits***
E Reduced Budget	-1.915	2.201	.286	14.01	-1.87	2.178	.308	17.98
F RPA	-3.839	4.598	.759	18.94	-3.466	4.251	.785	22.01
C Noncommodity Emphasis	-3.923	4.507	.584	18.69	-3.569	4.232	.663	21.73
B Commodity Emphasis	-3.923	4.77	.847	18.94	-3.609	4.475	.866	22.07
D Preferred	-3.946	4.708	.762	18.85	-3.587	4.386	.799	21.94
A Current Direction	-4.088	4.87	.782	18.88	-3.751	4.572	.821	21.92

* Costs are agency or taxpayer expenditures and do not include payments to Counties and expenditures by cooperators.

** Cash receipts are income from timber sales, grazing fees, developed recreation, and special uses such as lodges, ski areas, and outfitters and guides; they do not include cash income from mineral leasing estimated at $1.1 million per year.

*** These values do not include $164.2 million of nonpriced benefit from water which would be produced without any active management of the Forest.

TABLE II-13

Comparison of Present Net Value, Net Cash Flow, Noncash Benefits, Employment, and Income

Alternative	Billion$ PNV	Million$ Net Cash Flow		Million$ Noncash Benefits*		Forest Dependent Employment (Number of Jobs)	Total Income to Economic Impact Area (Million Dollars)
		1st Decade	5th Decade	1st Decade	5th Decade		
F RPA	419.1	-3.839	-3.466	18.94	22.01	1227	16.22
B Commodity Emphasis	416.6	-3.923	-3.609	18.94	22.07	1269	16.91
D Preferred	409.3	-3.946	-3.587	18.85	21.94	1244	16.48
A Current Direction	407.1	-4.088	-3.751	18.88	21.92	1185	15.67
C Noncommodity Emphasis	406.8	-3.923	-3.569	18.69	21.73	1221	15.90
E Reduced Budget	394.	-1.915	-1.87	14.01	17.98	921	11.52

* These values do not include 162.2 million of nonpriced benefit from water which would be produced without any active management of the Forest.

TABLE II-14

Average Annual Expenditures and Returns to the U.S. Treasury
(In Millions of 1982 Dollars)

	Alternative					
	A	B	C	D	E	F
Decade 1						
Budget Expenditures	4.87	4.77	4.51	4.71	2.20	4.60
Returns to Treasury	.782	.847	.584	.762	.286	.759
Decade 2						
Budget Expenditures	5.08	5.07	4.83	4.97	2.55	4.78
Returns to Treasury	.771	.840	.647	.758	.304	.750
Decade 3						
Budget Expenditures	4.78	4.57	4.49	4.61	2.32	4.38
Returns to Treasury	.825	.877	.662	.799	.305	.787
Decade 4						
Budget Expenditures	4.46	4.50	4.24	4.33	2.25	4.25
Returns to Treasury	.825	.890	.667	.807	.317	.792
Decade 5						
Budget Expenditures	4.57	4.48	4.23	4.39	2.18	4.25
Returns to Treasury	.821	.866	.663	.799	.308	.785

17 percent of the Forest is suitable for grazing of domestic livestock with about 5 percent of that occuring in winter range deemed crucial for supporting wildlife. These facts, plus a relatively low demand for developed recreation mean that total receipts collected for these outputs cannot and do not cover the entire cost of managing the approximately 2.5 million acres of the Forest.

Therefore, it is not possible for the Forest to show a positive cash flow when comparing direct receipts collected and total management costs. This could change if oil and gas is discovered on the Forest and receipts from such production are included in the cash flow calculation. The general trend in ranking of alternatives by cash flow is directly correlated with the budget; the smaller the budget the higher the net cash flow.

Two exceptions to this trend are found in Alternatives F and B. Both focus on producing high amounts of commodities at the least possible cost. Alternative F is the most efficient in this respect, and its increase in cost is more than compensated by the increase in cash receipts when compared with other alternatives. Alternative B has only a slightly higher budget than Alternative D, but again receipts produced by the higher overall commodity production of B more than compensate for this slight increase in cost during the first decade. Projections through the planning horizon show that by the fifth decade, the cash flow of Alternative B drops below that of Alternative D. This is because the intent of Alternative D is to move toward the desired management system of the Forest at a quicker rate and thus incurs slightly higher costs in the first decade.

The relationship between PNV, cash flows, and noncash benefits as assigned to nonmarket outputs is shown in Table II-13. From this table, it is clear that noncash benefits derived through management of the Forest greatly exceed both budgets and the cash flow deficits of all alternatives. This illustrates the point that the Forest and its management are valuable to the American public for such things as the total benefit from grazing, recreation and wildlife.

Production of timber and domestic livestock forage more than pay for themselves, as shown in Table II-10. Costs and benefits directly attributable to these two areas of production show benefit/cost ratios of 2:1 to 3:1 for timber and up to 20:1 for grazing. In looking at all economic indicators, including impacts on local economies, it appears that a mix of outputs which produces cash flows and noncash outputs maximizes economic benefits to society. The question is then raised as to which mix is best. The difficulty of the question is compounded by taking environmental and social effects or imperatives into consideration.

Major Trade-offs Between Alternatives

Each alternative is designed to address issues and concerns differently. Complete understanding of differences between alternatives can be gained only by studying all of Chapters II and IV, as well as such appendices as A, B, D and F. A summary of comparisons between alternatives, touching on major differences in respect to issues and concerns, can be found in Table II-4. The purpose of this section is to discuss differences between alternatives in terms of economic indicators, including PNV, cash flows, costs and benefits of major program areas, and economic impacts. A summary of reasons for significant differences in these indicators is also given here, by alternative.

The primary reference for this discussion is Table Ii-10. This table displays the ranking of alternatives in terms of PNV, benefits and variable costs directly attributable to each major program area. Costs for general administration, offices and equipment, and overall program management are not included. These costs are constant or nearly so for all alternatives and inclusion of them would mask real differences between alternatives. Even though costs directly attributable to each major program area are displayed, caution should be exercised when studying them. Many of these costs are for practices which produce multiple-use outputs. For example, one cost attributed to the timber program is timber sale preparation. In alternatives such as C and D, these costs include careful design of harvest blocks to maximize beneficial effects on wildlife and visual diversity. Therefore, such costs are not pure timber costs, but relate to wildlife and recreation as well.

There are no significant differences in alternative PNV's, the largest being a 6 percent difference between the reduced budget alternative and the RPA alternative. This is because all alternatives produce recreation use at or near the maximum anticipated demand (wildlife resources are valued through their recreational value for hunting, fishing and viewing). Recreation (and therefore wildlife) values produced on the Forest comprise about 92 percent of the benefit values of management. Because quantifiable recreation benefits do not change significantly by alternative, the fact that they comprise 92 percent of the benefit values means that PNV cannot change significantly between alternatives regardless of production levels for other goods and services. Significant differences between alternatives are in the quality of production, and how, where, or when practices are applied.

Alternative F. The PNV of this alternative is essentially the same as the maximum PNV benchmark (it is 0.4 percent less). This alternative responds to meeting the Forest's share of national production of goods and services, as directed under the authority of the Resource Planning Act of 1974. This includes meeting production targets for dispersed and developed recreation (including wilderness recreation), wildlife habitat, timber outputs, watershed improvement, and grazing of domestic livestock. The focus of this alternative is to meet these goals in the most cost efficient manner possible.

Differences between this alternative and the maximum PNV benchmark include a slight increase in both timber and grazing of domestic livestock. Doing this while meeting the same amount of recreation and wildlife outputs involves slight increases in costs for both of these areas. The increase in net cash flow generated by timber and grazing is not large enough to compensate for increased costs of the multiple-use management strategies selected to meet the total set of targets for all goods and services efficiently.

A major set of issues on the Forest relates to the negative effect of commodity production on both wildlife and recreation. The cost-efficiency orientation of this alternative emphasizes standard levels of timber harvest, road construction and maintenance, and oil and gas exploration and development. This means that though the quantifiable production levels of recreation and wildlife were met within this alternative, the manner in which they were met did not address this set of issues well. Given that much of this Forest is within the greater Yellowstone area, and as such is of national interest in terms of wildlife and recreation, not responding to this set of issues appears to be a significant flaw of this alternative.

Alternative B. The PNV of this alternative is 0.5 percent less than the maximum PNV benchmark. It was formulated to respond to issues and concerns calling for increased timber harvest, more grazing of domestic livestock, minimum restrictions on oil and gas exploration and development, and meeting maximum demands for developed recreation.

In this alternative, timber products and forage for domestic livestock are produced near their maximum levels. Coordinated management strategies necessary for such levels of production require more road construction and maintenance than in Alternative F. Also, larger Forest Service costs for managing timber, range, and recreation facilities would be realized. These increases in cost exceed the increase in revenues and benefits generated by higher production of the selected goods and services.

This alternative results in the maximum impact on local economies in terms of both jobs and income produced. So not only does this alternative address issues and concerns related to higher production levels of commodity oriented goods and services, it favorably addresses issues and concerns related to community stability and moderate growth as well.

Like Alternative F, the standards and guidelines for production of timber, grazing of domestic livestock, and oil and gas exploration and development are at the level necessary to meet minimum legal standards for impacts on soil, water, air and wildlife. Therefore, like Alternative F, this alternative does not adequately address issues and concerns dealing with the negative impacts of these activities on recreation, visual quality, and wildlife. Increases in production of these outputs, while meeting minimum water and air quality standards, increase the risk of cumulative impacts or site-specific violation of such standards. Further, because range management intensifies, costs of maintaining range structures imposed on permittees increases in this alternative. In some cases, the increase in permitted cattle AUMs would not provide sufficient revenues to cover increased range management costs.

Alternative D. The PNV of this alternative is 2.3 percent less than the maximum PNV benchmark. It was formulated to respond to issues and concerns related to production of high quality, low density recreation; high quality wildlife habitat; and low risk to air, soil and water resources. It was also formulated to meet historic demand levels of timber, forage for domestic livestock, and developed recreation (including outfitters and guides). It also allows for oil and gas exploration and development to the maximum extent possible while meeting objectives for recreation, wildlife habitat, watershed and visual resources.

When compared with the maximum PNV benchmark, this alternative produces nearly 4 percent more timber in the first decade. This production was made possible by slight increases in roads required for the multiple-use management strategies chosen. Production of forage for domestic livestock is about 1 percent less than for the maximum PNV benchmark, but shifts slightly toward more cattle rather than domestic sheep. The combination of shifts for timber and range mean that variable costs for these programs go up, while increases in timber benefits are almost identical to decreases in range benefits. Net change then is a slightly lower PNV for these two program areas.

In addition to this are increases in both road construction/reconstruction and road maintenance costs. These are incurred to provide better access to the Forest in response to issues calling for better access and lower density of recreation users. Similarly, there are increases in costs for recreation facilities, including trailheads and trails. Again, this is in response to issues calling for greater dispersion of recreation users and provision of higher quality recreation experiences.

Conversely, recreation operation and administration costs drop because this alternative provides more total pristine and primitive recreation than any other alternative. Again this is an attempt to meet issues calling for high quality, low density recreation. Because of this shift in recreation opportunities, administration costs go down in response to the lower costs of management for this type of recreation experience.

These are the most significant differences in the quantifiable measures of alternatives displayed in this Chapter. Other points of note in terms of meeting issues and concerns include standards and guidelines for timber management, road management strategies, and stipulations and operating standards that will be recommended under this alternative for oil and gas leasing, exploration, and development.

The forest condition selected as the target for even-age timber management in this alternative includes limiting harvest blocks to 25 to 35 acres in size. Further, adequate dispersion of harvest units and maintenance of wildlife cover surrounding cut blocks are called for. This forest condition was chosen to maximize the beneficial effect of timber harvest on wildlife, provide high quality edge, and provide for quality visual diversity. From a timber management standpoint, this also provides a mosaic of age classes that will be less susceptible to catastrophic insect and disease attacks.

As stated, this alternative requires more roads than the maximum PNV benchmark. These roads are necessary to provide access to the Forest for recreation, range management, wildlife management, and timber management. Roads open to the public, particularly in wildlife winter range, can be detrimental to wildlife. To mitigate this and meet the intent of this alternative, a high level of seasonal road closures is called for. This type of management is slightly more expensive than leaving those roads open and therefore decreases total PNV slightly.

As in all alternatives, all acres currently available for oil and gas leasing are available in this alternative. However, stipulations and operating standards for leasing, exploration and development are tailored to blend such operations into the management intent of this alternative. This is done on an area-specific basis, depending on the management strategy selected for each analysis area and the types of land (crucial preferred winter range, high hazard to soil and water, etc.) within each analysis area. (This is displayed in the minerals discussions in Chapters II and IV of this document and Appendices J and K of the Plan.)

By producing timber, developed recreation and forage for domestic livestock at or slightly above historic levels while emphasizing high quality recreation and wildlife habitat, this alternative provides for stability of local economies. This addresses issues and concerns related to maintaining such stability.

Alternative A. The PNV of this alternative is 2.8 percent less than that of the maximum PNV benchmark. This alternative was formulated to portray what would happen if the direction in existing plans and policies were implemented.

Timber production in this alternative is the second highest of all alternatives falling behind only Alternative B. In this case, the added timber benefits outweigh added timber costs which provide a marginal increase in total PNV. By providing timber at a level slightly higher than historic levels, this alternative addresses issues surrounding increased timber harvest and support for timber-based employment. This increase in timber production comes with a slight increase in acres suited for timber management. This occurs in areas of low productivity lodgepole pine and would slightly enhance the Forest's ability to deal with current insect and disease problems. Standards for timber harvest would not be as oriented toward maximizing wildife benefits from such operations as in Alternatives C or D. Further, the increase in road costs necessary for this increase in harvest are greater than the increase in net timber benefit. A high level of seasonal road closures is provided in this alternative to mitigate potential effects on wildlife water ranges.

Production of forage for domestic livestock is about the same as for the maximim PNV benchmark as are costs and benefits, which is sufficient to support historic levels of grazing on the Forests. This alternative favorably addresses range commodity issues. Further, this alternative includes fairly intensive range management; when coupled with wildlife improvements included in this alternative, the net effect would benefit wildlife. Additional costs are incurred to address issues and concerns surrounding quality wildlife habitat, with some local exceptions.

Recreation benefits are slightly less for this alternative than for the maximum PNV benchmark. However, costs for maintenance of facilities and trails are higher. Probable recreation use is less than the maximum that would be demanded under a different management emphasis, and the quality of facilities and experience will generally be high. These costs are incurred to address issues and concerns calling for provision of high quality recreation experiences.

Treatment of oil and gas issues in this alternative is identical to the treatments in Alternatives B, E and F. It therefore adequately addresses issues relating to commodity production as an overriding benefit. However, there are some areas on the Forest, particularly crucial winter ranges, where the standards for oil and gas operations are similar in this alternative to standards in Alternatives C and D.

Economic impacts of this alternative show little difference from others because of timber, range and recreation outputs produced. This alternative would provide for slight growth in local communities.

Alternative C. The PNV of this alternative is 3 percent less than that of the maximum PNV benchmark. This alternative was formulated to address issues and concerns calling for more emphasis on amenity values and less emphasis on timber harvest, grazing of domestic livestock, and oil and gas leasing, exploration, and development. It was also formulated to meet demands for more quality recreation, including better access to the Forest. Amenity values include wildlife and fish, watershed, and visual and recreation experiences in a natural or near-natural setting.

In attempting to meet these issues and concerns, timber harvest drops below historic levels and planned harvest is 25 percent below that of the maximum PNV alternative. This decreases both timber costs and benefits with a net decrease in PNV of about a billion dollars over the life of the plan directly attributable to changes in timber. Similarly there is a 28 percent decrease in forage for domestic livestock, accounting for a decrease in PNV of about 5 billion dollars. Because all alternatives would produce about the same recreation benefits, increasing emphasis on recreation did not offset these losses to PNV. In terms of overall PNV (419 billion in the maximum PNV benchmark) these decreases are not significant.

Under this alternative, forage available for wildlife increases significantly over other alternatives except E. However, most of this increase occurs in summer range where there is already ample summer range available to support herd unit targets for the Forest. All alternatives provide protection of crucial preferred wildlife winter range and most meet herd unit targets over the Forest with one exception. That one exception (the North Fork elk herd unit) can not be provided for in any alternative. Therefore, there are no increases in wildlife benefits to offset the losses in PNV caused by decreasing forage for domestic livestock.

This alternative contains the same standards for timber harvest as Alternative D. Thus, timber harvest under this alternative would be designed to maximize beneficial effects on wildife. The decrease in harvest in this alternative, however, would make the overall benefit less than that of Alternative D.

Also, like Alternative D, this alternative contains stipulations and operating standards for oil and gas leasing, explorationm, and development that are more stringent than those in other alternatives. This would lessen risk to air, soil and water as well as mitigate effects on recreation, visuals and wildlife. Imposition of these standards has a significant effect on lease values and PNV associated with oil and gas, dropping both significantly.

Because this alternative produces timber and forage for domestic livestock at lower than historic levels, and because all alternatives provide enough recreation opportunities to meet demand, this alternative would have a tendancy to destabilize local economies. There would be no increase in recreation-related jobs to compensate for jobs and income lost in areas related to timber and ranching. Over the entire economic impact area, the significance of this is minor. However, in some of the small communities adjacent to the Forest, this could have a significant effect by causing a downturn over at least the next five to ten years.

Alternative E. The PNV of this alternative is 6 percent less than that of the maximum PNV benchmark. This alternative was formulated to respond to issues and concerns associated with the possibility of budget reductions. It portrays one possibility that could occur if the budget was reduced to 75 percent of the 1982 fiscal year budget.

Decreases in PNV are related to an across the board decrease in production of all goods and services. Timber production drops by almost 72 percent from the maximum PNV benchmark. Forage for domestic livestock is reduced by almost 60 percent while recreation benefits fall by almost 11 percent. The decreases in costs necessary to produce these outputs are far exceeded by the loss of benefits at the lowered production levels.

Even though recreational benefits are 90 percent of their maximum, the associated decreases in costs for maintenance of facilities and trails, coupled with decreased costs of operation and administration mean that the quality of recreation will decrease from current levels. This quality will be significantly below the quality provided in other alternatives. Thus this alternative does not address issues and concerns calling for high quality recreation experiences. Further, the decreases in road construction and maintenance means that access problems will not be resolved and the attractiveness for motorized recreation, including driving to a trail head, will decline.

Similarly, decreases in range management and timber management will adversely effect the ability of the Forest to provide quality wildlife habitat. The majority of increases in forage will be on summer range where there is already enough to support herd unit targets. Decreases in timber harvest will mean that the small amount that could be done to improve spring-fall range through appropriate timber harvest will be curtailed. Thus, this alternative does not favorably address issues and concerns dealing with provision of greater amounts of quality wildife habitat and may mean a slow decline in current wildlife population levels.

Issues and concerns regarding historic demands for timber and forage for domestic livestock will not be favorably addressed in this alternative. Most mills and many dependent ranchers will effectively be put out of business.

This alternative allows for oil and gas leasing, exploration, and development with standards to meet minimum legal requirements. From this standpoint, it favorably addresses issues and concerns that call for the fewest possible restrictions on such operations. But as with alternatives A, B, and F, it does little to address concerns about tailoring such activities in recognition of the visual, recreation, and wildlife resource values of the Forest.

Economic impacts of this alternative are the most significant of all alternatives because of decreases in timber, range, and recreation outputs. There would be decreases in jobs and income in industries related to these outputs.

Economic Impact Analysis

In order to estimate impacts on local economies and population, IMPLAN and economic input/output model was used. This was done for the two economic impact areas of the Forest, represented by Park County and Fremont County, Wyoming. Data used included the standard IMPLAN database of secondary

TABLE II-15

Forest-Related Population, Income, and Employment Impacts[1]

	Population	Personal Income (Million Dollars)	Property Income (Million Dollars)	Total Income (Million Dollars)	Employment (Number of Jobs)	Unemployment (Percent)	Payments to Counties (Million Dollars)
Fremont Economic Impact Area							
Total	33,637	109.0	69.	178.0	9516	4.00	
Forest-Related (1977 Base)	429	2.28	1.44	3.73	284	---	
Changes from Forest-Related Base by Alternative (1990 Index Year)							
B	+750	+2.14	+1.36	+3.49	+277	-0.68	.1165
D	+710	+2.02	+1.27	+3.28	+265	-0.67	.1048
F	+692	+1.96	+1.24	+3.2	+259	-0.66	.1045
C	+677	+1.87	+1.13	+2.99	+253	-0.65	.0803
A	+624	+1.8	+1.15	+2.94	+238	-0.64	.1075
E	+294	+0.72	+0.34	+1.05	+117	-0.34	.0393
Park Economic Impact Area							
Total	12,600	70.28	108.1	178.3	6701	3.84	
Forest-Related(1977 Base)	246	2.48	1.57	4.06	290	---	
Changes from Forest-Related Base by Alternative (1990 Index Year)							
B	+710	+3.37	+2.27	+5.64	+419	-0.60	.0953
D	+686	+3.24	+2.17	+5.42	+406	-0.60	.0857
F	+666	+3.13	+2.11	+5.24	+395	-0.60	.0855
C	+670	+3.12	+2.01	+5.13	+395	-0.54	.0657
A	+626	+2.94	+2.01	+4.95	+374	-0.60	.0880
E	+392	+1.69	+1.00	+2.69	+231	-0.32	.0322

1/ Data on the economic structure of the two economic impact areas came from the data base developed nationally to support the IMPLAN computer program (see Appendix B). Employment data was derived from County data gathered by the State of Wyoming and the U.S. Census Bureau.

information coupled with primary data to include outfitters and guides as a separate sector (see Appendix B for a full explanation of these models).

Economic Impact Effects

Table II-15 displays the economic impacts of alternatives in terms of changes in population in each economic impact area, the number of Forest-related jobs, unemployment, and personal, property and total income.

The ranking of alternatives in terms of beneficial economic impacts is the same for both economic impact areas; Alternative B is best and then D, F, C, A and E. All economic impact indicators follow this progression with one exception. The exception is Alternative C in the northern economic impact area. In this case, there is a relatively larger change in population and significantly lower impact on unemployment than in other alternatives. As discussed in the alternative PNV comparison, recreation sectors of the economy are about at maximum in terms of meeting demand. Therefore, workers with skills in recreation-related sectors are nearly fully employed. Alternative C emphasizes decreases in commodities in order to focus on preservation of the Forest in an effort to enhance recreation and wildlife. Workers necessary for supporting increases in recreation must migrate in, leaving unemployed those currently unemployed in sectors associated with timber production and ranching.

Relative economic impacts followed the same pattern as relative PNV. That is, those alternatives which produced more market outputs tended to have greater economic impacts. Again, all alternatives provide all or nearly all recreation capacity necessary to meet all demands. Thus there is little or no difference between alternatives in terms of supporting local recreation based sectors of the economy. The areas of difference between alternatives appears to be in those sectors related to and supporting timber industries and ranching.

Currently, most local economies are suffering losses because of a general decline in oil and gas activities off of the Forest. Compounding this are losses in other energy-related sectors and mining sectors within the southern economic impact area. With recreation at or near its maximum on the Forest, the only sectors which can aid these depressed economies are those related to timber and ranching. If a large oil and gas field is discovered on the Forest, this too could aid in economic recovery.

Social Effects

Each alternative, and the perception of the emphasis of each, can impact the social well being of local communities. These effects are often described in terms of lifestyles, attitudes, beliefs, values, social organization, population, and land use. A procedure for social impact assessment that focuses on identifying polarization levels provided information for assessing how each alternative would effect social well-being (see Appendix F). Also, many effects on measures of social impacts are based on economic impacts. For this reason, economic impact information was also used to assess social impacts. (This was one of the reasons for defining economic impact areas and social impact areas with the same boundaries.)

Polarization is a measure of how issues concerning resource management will be accepted by the public. The more polarized a community becomes, the more likely there will be groups organizing and taking sides on resource management issues. This could lead to appeals and court battles as each side fights for its belief. Not only does this affect management of the Forest, but it affects the social well-being of communities as well.

In any community, there is a pool of volunteer time, donations, and other resources that people are willing to give to keep abreast of changes in their community. If a community becomes polarized, then some of those resources are devoted to resolution of the polarizing issues. Further, as groups organize, group members tend to change their lifestyles, attitudes, beliefs, and values toward extremes. Often this detracts from cooperation, encourages confrontation and tends to change the ability of social organizations to find resources and volunteers to work together in community betterment projects.

Social impact analysis was done for two impact areas: a northern area representing impacts on Park and Hot Springs counties; and a southern area representing impacts on Fremont, Teton and Sublette counties. These represent social impacts of managing the northern three districts and southern two districts respectively.

Results of social impact assessment for preliminary alternatives showed that people in both social impact areas were polarized over some facets of current management. Polarization increased as the emphasis of an alternative moved toward production of commodities at the expense of noncommodity values, and decreased as the emphasis of an alternative shifted toward protection and enhancement of noncommodity values such as wildlife, scenic beauty, and high quality recreation. In one measure of polarization, it was found that a mix of commodity and noncommodity emphases tended to lower the intensity of polarization. In other words, people still tended to choose sides, but their interest in organizing to fight for one side or the other was lower than with a single emphasis on either noncommodities or commodities. The following assessments of impacts on lifestyles, attitudes, beliefs, values, social organization, land use and population are based in part on this assessment of preliminary alternatives.

Northern Social Impact Area

Social impacts of managing the northern three Ranger Districts, Clarks Fork, Wapiti and Greybull, are typified by impacts in the northern impact area.

Lifestyle. Lifestyle in the northern impact area is affected by the Forest in a number of ways. First, the Forest is used by many for meeting their recreational needs including needs for solitude. The abundant game, scenic beauty, and relatively low density of use on the Forest contribute greatly to the lifestyles of most residents. Beyond this, some base their lifestyles on working directly with production of goods and services from the Forest; these include ranchers, wranglers, outfitters and guides, lodge owners, and lumbermen. By changing the mix of goods and services produced and the way those goods and services are produced, management of the Forest can greatly affect these lifestyles.

Because Alternatives A and F are so close to one another in terms of production of goods and services, their effects would be the same, and would not significantly impact current lifestyles. However, current policies regarding oil and gas operations are causing some changes in lifestyles. These policies are found in both of these alternatives. Under these alternatives, post cooperation among many individuals would change to competition. If continued, this could degrade relationships which form a basis for at least part of the lifestyles enjoyed by local residents.

The trend away from cooperation, and its impacts on lifestyles, would be heightened in Alternative B. Alternative B would be perceived as a threat to many lifestyles by local residents because of the commodity emphasis of this alternative. Many more people are dependent on the noncommodity goods and services from the Forest to help define their lifestyles than on commodity goods and services. This alternative is perceived as a threat to noncommodities by opening the Forest with minimum restrictions to oil and gas development and increasing the amount of area roaded and managed for timber. Alternative B would have a net negative effect on lifestyles.

Alternative C, with its emphasis on production of noncommodity goods and services would have generally slight effects on local lifestyles. However,some who define their lifestlyes in terms of ranching, timbering and oil and gas operations would be adversely impacted because of the decreases in these areas. Stringent stipulations and probable operating standards for oil and gas operations, applied Forest-wide, would be perceived as a threat to the livelihood and lifestyle of one segment of the area's population.

The effects of Alternative E would be similar in the short-term except for impacts related to oil and gas operations. In this respect, impacts would resemble those of Alternatives A, B, and F. Over the long-term, Alternative E would have a net detrimental effect while trails, wildlife improvements, and Forest conditions deteriorate because almost all lifestyles in this area include outdoor pursuits. In terms of impacts on local lifestyles, this alternative has the potential for the most significant impacts.

Alternative D would have a net benefical effect on local lifestyles. As stated earlier, this alternative favors production of noncommodities which should beneficially impact those lifestyles associated with recreation and hunting. It favors this production jointly with production of commodities in a cost efficient way whenever possible. This results in a slight increase in production of commodities above current levels which would be beneficial to those lifestlyes associated with commodities. As stated earlier, there is a growing polarization over current policies regarding timbering, road building and oil and gas development. This alternative attempts to blend these uses of the Forest into a coordinated management strategy for noncommodity resource values. As such, it should allow most lifestyles to continue as in the past while removing some of the current polarization over these issues.

Attitudes, Beliefs, and Values. Attitudes, beliefs, and values would be detrimentally impacted under Alternatives A, B, E, and F. This is because these alternatives would create increased polarization between commodity users of the Forest, particularly oil and gas interests, and noncommodity users. This polarization has already had a detrimental effect on attitudes, beliefs and values, as people have organized into groups to fight with each other in public forums. Competition, rather than cooperation, would prevail under these alternatives.

Alternative C would have a slightly negative effect, but not as great as A, B, E or F. This is because the majority of groups are either for or are neutral to an emphasis on noncommodity production. There would be some polarization under this alternative because of the decrease in forage for domestic livestock, decrease in timbering and restrictions on oil and gas operations. Through time, this alternative would affect the types of people living in local communities. More people related to recreation and wildlife sectors of the economy would move into the area. Further, some that are currently employed or skilled in timbering, oil and gas operations or ranching could leave the area. This shift would affect the mix of attitudes, beliefs and values prevalent in the area now.

Alternative D would either have no effect or slightly positive effect on attitudes, beliefs and values, for it requires close coordination between potentially competing interests. It provides for an emphasis on high quality recreation and wildlife habitat management. In this way it would help maintain values that are historically associated with the Forest. It would do this in a way that also provides for historic levels of operations in developed recreation, timbering and ranching. It would help the area retain these sectors of the population and the mix of attitudes, beliefs and values associated with them. Acceptance of this alternative would require compromise on the part of currently polarized interests dealing with oil and gas operations.

Social Organization. Alternatives A, B, E, and F would have a negative effect on social organization. This has been illustrated recently by the way some community betterment organizations have lost participants and donations as people have organized in conflicts involving oil and gas operations on the Forest. Further these alternatives would contribute to increased polarization. Because of the relatively small population base of this area, many organizations, both formal and informal, would find a split within their memberships between those who favor development and those who favor preservation.

Alternative C would have a different effect on social organizations. Many in the local area favor a noncommodity emphasis on the Forest. But, as commodity production declines based on this alternative, those associated with commodity production would become more vocal. This would tend to impact social organizations in ways similar to Alternatives A, B, E and F. Beyond that, there would be more people, possibly greater unemployment and potentially lower tax revenues generated by such things as timber and oil and gas. This would put an additional burden on local organizations to provide services while the pool of dollars and volunteer services are declining. Some organizations could find such a situation a threat to their viability.

Alternative D is designed, in part, to avoid problems associated with other alternatives. It is designed to reduce intensity of polarization, but not to eliminate it (total elimination of polarization is not possible). Reducing the intensity of polarization and emphasizing coordinated development of resources, where amenity and commodity values must be considered together, would provide a forum for negotiations. It would foster close working relationships between all factions involved or affected by management of the Forest. Results of this type of working relationship could spill over into other areas of community life, making it possible for social organizations to tap the full depth of experience available locally. Further, careful production of commodities and operations associated with oil and gas operations are provided for within this alternative. This will help stem the currently declining tax base, particularly if a major oil and gas find is discovered and developed. This in turn will provide resources for both formal and informal social organizations to provide necessary services to local citizens.

Population and Land Use. Alternative E would have the most significant effect on population and land use in relation to its large negative impact on the number of jobs supported by the Forest. Recently there has been a flurry of oil and gas exploration activity, but this has been of a short-term nature and has not stemmed the decline in jobs or economic activity associated with this economic sector. The decline in Forest-related employment in this alternative would contribute to this decline in population and economic viability.

Alternative C could have a significant effect on short-term population growth for it has the largest relative increase in population. This, combined with potentially greater unemployment, would impact population and land use significantly.

Alternatives A, B, D and F would be similar to each other, regarding impacts on population and land use. Each would result in about the same change in employment, while bringing in more people. Such immigration would involve a mix of economic sectors, including recreation, timber, ranching and oil and gas operations. This mix would be similar to the current mix, so that growth would follow current patterns. None of these alternatives would cause changes in population beyond the ability of local communities to provide for resulting growth.

Southern Social Impact Area

Social impacts of managing the southern two Ranger Districts, Wind River and Lander, are typified by impacts on the southern social impact area.

Lifestyles. Lifestyles in the southern social impact area associated with the Forest are dependent on both commodity production and noncommodity production. Timber and ranching lifestyles make up a significant portion as do outfitting and guiding and recreation oriented lifestyles. This means that alternatives favoring one over the other would have a net negative impact on lifestyles. This includes Alternatives B, C, E, and F. Alternative A and D would have the same type of effect as in the northern social impact area.

Attitudes, Beliefs and Values. Alternatives would have similar impacts on attitudes, beliefs and values in the southern social impact area as they do in the northern area. Conflicts in attitudes, beliefs and values in this social impact area appear to focus on wildlife and recreation use of the Forest versus timber harvest and grazing of domestic livestock. On one side, there is a belief that timber operations and grazing will detrimentally effect wildlife in particular and nonmotorized recreation as well. This belief is strong and many have joined organizations that support this position. On the other side, there are many who view timbering and ranching as vital components of the local economy and culture. They point to areas on the Forest where such operations appear to be beneficial to wildlife as well as to visual diversity. Organizations supporting this belief have also been established recently, in part to counter the efforts of organizations on the other side of this issue. This is not just a local debate. It has involved people from across Wyoming, leading to testimony before Congress by local citizens and representatives of the State of Wyoming.

In this context, alternatives which favor one side or the other would tend both to polarize those in local communities and to galvanize their beliefs. This would be the impact of Alternatives B, C, and F. Alternative A would have a similar impact for there is significant debate concerning current management policies and plans.

Alternative E would in the short term, have an impact similar to Alternative C. It appears that many who have the belief that timbering and grazing of domestic livestock are harmful feel that the less management done by the Forest Service, the better wildlife and recreation resource values will be preserved. In the long term, as wildlife habitat improvements, trails and recreation facilities decline under this alternative, there would be growing dissatisfaction and public sentiment for more active management of wildlife and recreation resources. This could trigger a long-term change in attitudes, beliefs and values of this group. Those with beliefs that commodity production is a higher priority function of the Forest will be dissatisfied with this alternative from the beginning. This will tend to galvanize their beliefs and will probably cause them to contribute more time and money to fight for their position. No change in their attitudes, beliefs and values other than a reinforcement that they are correct will occur under this alternative.

Alternative D has the potential for altering attitudes, beliefs and values rather than galvanizing them. It is designed to emphasize noncommodity goods and services while producing historic levels of commodities. Many people in this social impact area do not believe that this is possible. As implementation occurs under this alternative, and as public participation is encouraged, changes in beliefs are possible. This in turn would defuse current polarization within this social impact area.

Social Organization. Controversy and polarization of local residents has grown since the social analysis supporting the draft EIS was done. It appears now that substantial time and resources have been diverted recently from many local social organizations. These resources have been mobilized to help bring the viewpoints of the two sides discussed above to local, regional and national forums. This tends to have a negative effect on older social organizations in the area. This effect on social organizations and clubs would place additional burdens on local formal organizations whose role it is to provide social services. Though the controversy and creation of new advocate groups do not appear to affect residents of the Wind River Reservation directly, placing additional burdens on county-wide support organizations may hamper the provision of some services to these residents.

Alternatives A, B, C, and F would continue the trend of taking resources away from existing social organizations. In the short term, Alternative E would have a similar effect, but over the long-term it may bring groups together to push for more active management of the Forest. If Alternative D works as designed, it will continue this trend but to a much lower degree over the short-term. In the long-term (between 5 and 10 years), it could reverse this trend.

Population and Land Use. Effects on population and land use would be similar to those in the northern social impact area. In communities such as Dubois, many residents associated with recreation sectors appear to be more affluent and tend to reside outside the city limits. This trend, over about the last ten years, has brought about a proliferation of development in rural areas. Some of this has occurred on important winter range for deer, elk and moose. All alternatives except E would continue this trend. Alternative C could have the most significant impacts in bringing about such development.

Many communities in this area are experiencing an economic downturn associated with declining activity in mining, energy-related industries and timbering. Alternatives which produce at least historic levels of commodities or which facilitate oil and gas activities would tend to slow this decline. The descending order of alternative commodity production levels would be Alternatives B, F, A and D. Alternatives C and E could have just the opposite effect and could contribute to the economic decline. Such a decline would appear to affect people who live in towns more than those in rural areas. If continued, this trend will change the proportion of people living within city limits of local communities to those who live outside those limits, shifting toward a more rural population. This could impact the ability of an affected community to provide necessary support services and to control point and nonpoint sources of air and water pollution.

OTHER COMPARISONS

FORPLAN Prescriptions and Direction for Management Areas

As described at the beginning of this chapter, the Forest was divided into 109 analysis areas. Based on the characteristics of each analysis area, alternative strategies for managing the area were developed, and the corresponding forest conditions described. FORPLAN prescriptions were developed for each set of forest conditions. A FORPLAN prescription is a coordinated set of practices for a specific analysis area designed to produce a given forest condition.

Following benchmark analysis, analysis of preliminary alternatives, and formulation of alternatives to be considered in detail, FORPLAN selects the specific FORPLAN prescription on each and every analysis area that meets the intent of the alternative in the most cost efficient way. Table II-16 displays the FORPLAN prescriptions selected on each analysis area in each alternative. The FORPLAN prescriptions shown for Alternative D, Preferred, are described in Appendix J of the Forest Plan. The descriptions in Appendix J include a narrative describing management of the analysis area in general and management of individual resources in the analysis area, a summary of proposed and probable practices for the first decade, and a summary of expected outputs and effects for the first decade. Similiar narrative descriptions and complete listings of activities, outputs, and effects for all planning periods for every FORPLAN prescription in every alternative are in the planning records and are readily available for public examination. Refer to Appendix B for more details on Table II-16.

To aid in display of the general intent of each FORPLAN prescription and to aid display of standards and guidelines under which practices will be applied, each analysis area is subdivided into Management Areas. Direction for each Management Area includes a statement of intent and a set of standards and guidelines for applying the practices included in the FORPLAN prescriptions. Table II-17 displays the total acreages by alternative for each Management Area. The acres of each Management area on each analysis area in the Preferred alternative is shown in Table III-3 of the Forest Plan. Note that though the of FORPLAN prescriptions and Management Areas is similar. However, they are not the same, e.g., FORPLAN Prescription 1A is not the same as Management Area 1A. See beginning of this chapter and Chapter VII, Glossary, for clarification. Direction for each Management Area is included in Chapter III of the Forest Plan. Management Areas used in analysis but not included in Alternative D are included in Appendix G of this EIS.

Adverse Environmental Effects that Cannot be Avoided

Implementation of any of the alternatives would result in some adverse environmental effects that cannot be avoided. However, application of the management requirements in Chapter III of the Plan is intended to limit the extent and duration of these effects, or to ensure that legal minimum standards are met. Monitoring and implementation procedures given in Chapter IV of the Plan are key to ensuring proper application of requirements and minimizing adverse effects.

The degree or severity of the adverse effects can be minimized by adhering to the direction in the management area prescriptions, but some impacts cannot be avoided. These effects include:

Fire Management

Subsequent to logging and thinning operations, there will be temporary increases in fire hazard and control difficulty due to timber residues. Also, the fire risk will increase as a result of more people using an area during and after management activities. This effect will be mitigated by earlier detection and suppression, resulting in more fires controlled at small acreages. In the long term, fire hazard will be decreased through vegetation management activities as areas with accumulated natural fuels are put under management and fuel continuity is reduced.

Air Quality

The air quality will diminish on a local and temporary basis due to various management activities. Burning timber harvest debris piles, timber hauling and recreation traffic on untreated roads and the operation of internal combustion engines will adversely impact the air quality where these activities occur.

Impacts on air quality related values in Class I areas could be categorized as both irreversible or irretrievable resulting from the long term cumulative effects of airborne pollutants whose source is outside wilderness, on or off the Forest.

TABLE II-16

FORPLAN Prescriptions Selected 1/

		Alternative					
Analysis Area Number	Analysis Area Name 2/	A Current	B Commodity	C Non-Commodity	D Preferred	E Reduced Budget	F RPA
CLARKS FORK RANGER DISTRICT							
001	Bald Ridge	1M	1A	1A	1A	MN	1A
002	Basin	3M	5A	2C	3M	8A	3M
003	Bench	1A	1A	1A	1A	MN	1A
004	Crandall I (027 Crandall II)	1M	1M	7D	1M	7D	1M
005	Face of the Mountain	3A	3A	5A	3A	3A	3A
006	Ghost Creek	1M	1A	3D	1A	4A	1A
007	Lake Creek	7A	7A	7A	7A	7A	7A
008	Little Rock	1A	7A	7A	1A	7A	7A
009	Table Mountain	1M	2R	6C	2R	MN	7B
011	Bennett Creek (014 Deep Creek) (017 Little Rock)	1M	1A	1A	1R	MN	1R
013	Clay Butte (010 Beauty Lake) (015 Island Lake)	7M	7M	7M	7M	7M	7M
016	Line Creek West	3A	3A	3A	3A	MN	3A
018	Peat Beds (012 Burnt Mountain)	2A	4A	8B	6A	MN	4A
019	Stockade	2A	2M	1A	2M	MN	2M
020	North Absaroka	4A	4A	4A	4A	MN	4A
021	Sunlight/Trout Peak (158 Trout Peak)	4M	4M	2B	4M	MN	4M
022	Deep Lake	3A	4A	4A	4A	MN	4A
023	Emerald Lake	4A	4A	4A	4A	MN	4A
024	Lost Lake	3A	3A	3A	3A	3A	3A
025	Line Creek East	1A	5A	5A	1M	MN	1A
026	Beartooth Highway	1A	3A	1C	1B	1A	3A

TABLE II-16 (Continued)

FORPLAN Prescriptions Selected 1/

Analysis Area Number	Analysis Area Name 2/	Alternative A Current	B Commodity	C Non-Commodity	D Preferred	E Reduced Budget	F RPA
GREYBULL RANGER DISTRICT							
040	Deer Creek (041 Dick Creek) (050 Timber Creek)	1A	8B	8B	1A	8B	8B
042	Gooseberry (044 Guard Station)	3M	3M	3B	3M	MN	3M
043	Greybull	1M	7M	6A	3A	MN	7M
045	Kirwin	2A	2A	6A	8A	2A	2A
046	Pickett Creek	1A	3B	1A	3B	3B	3B
047	Rennerberg	2M	2M	6A	2M	4A	2M
048	Sage Creek	1A	4A	7A	1A	4A	1A
049	Sugarloaf	1A	7A	7A	7R	MN	7A
051	Wood River	1A	3A	7A	1A	3A	3A
052	Anderson Fork	4A	4A	4A	4M	4M	4M
054	Carter Mountain	2A	2A	6A	2A	MN	2A
055	Cottonwood	3M	8A	0A	2A	MN	8A
056	Cow Creek (071 Venus Creek)	3A	4A	3A	3M	3A	4A
057	East Fork (066 Twin Peaks)	4A	3A	4A	4A	MN	3A
058	Eleanor (068 Warhouse)	4B	4B	3A	3A	4B	4B
059	Francs Peak	2A	2A	5A	2A	MN	5A
061	Meeteetse Creek	2A	2M	6A	2A	MN	2M
063	Pickett	1A	1M	6A	1M	MN	1M
072	Yellowsteer Creek	1A	1A	4A	1A	MN	1A
073	Swing	1A	3M	3A	1A	MN	3M
074	Washakie Needles	4A	4A	1A	4A	MN	4A
075	Jack Creek Transportation	2A	3A	3A	3A	MN	3A
076	Piney	1A	1A	4A	1A	MN	1A
077	Wood River Transportation	2A	4M	4M	2A	MN	2A

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TABLE II-16 (Continued)

FORPLAN Prescriptions Selected 1/

		Alternative					
Analysis Area Number	Analysis Area Name 2/	A Current	B Commodity	C Non-Commodity	D Preferred	E Reduced Budget	F RPA
LANDER RANGER DISTRICT							
091	Bayer Mountain (093 Ed Young Basin) (096 Maxson Basin)	3A	3M	4B	3M	MN	7A
092	Dickinson Park	8A	8A	8A	8A	8A	8A
094	Frye Lake	7B	7B	7A	7B	7B	7B
095	Hays Park	3A	3A	3A	3A	MN	3A
097	Meadow Creek	3A	3A	1A	3A	MN	3A
098	Middle Fork	8M	8M	8M	8M	8M	8M
099	Sawmill	1A	3M	4A	3M	MN	3M
100	Shoshone Lake	8A	8M	8M	8M	8A	8A
101	South Pass	1A	2B	4A	1A	MN	2B
102	Squaw Creek	3A	6B	6B	3A	6B	6B
103	Atlantic	7A	7M	7M	7M	7M	7M
104	Glacier	2A	2A	4A	1A	MN	2A
105	Grave Lake	2A	3A	3A	2A	3A	3A
106	Little Wind	3A	3A	3A	3A	3A	3A
108	Pine/Willow	2A	0A	4A	2A	MN	0A
109	Slate Creek	1B	2A	6A	2A	MN	6A
110	Tayo	4A	4A	4A	2A	MN	4A
111	Beaver Creek	1A	1A	3A	2A	MN	1A
112	Atlantic City	1A	1A	1A	1A	1A	1A
113	Sand	5A	5A	5A	5A	5A	5A
114	Louis Lake	2A	3B	3B	2A	1A	3B
115	Roaring Fork	5A	5A	5A	5A	5A	5A
117	Dry Creek	2A	2A	2A	2A	MN	2A
118	Pristine	1A	1A	1A	1A	MN	1A

TABLE II-16 (Continued)

FORPLAN Prescriptions Selected 1/

Analysis Area Number	Analysis Area Name 2/	Alternative A Current	 B Commodity	 C Non-Commodity	 D Preferred	 E Reduced Budget	 F RPA
WAPITI RANGER DISTRICT							
131	Belknap	1A	1M	7A	3B	5B	2B
132	Big Creek	1M	1M	7A	7A	MN	7A
134	Bobcat (145 Ishawooa Hills)	1M	6A	6A	1M	6A	6A
135	Community	2A	2A	4A	2A	4A	2A
137	Deer Creek	7A	7A	7A	7A	7A	7A
140	Green Creek	1A	4A	3M	3M	4A	4A
143	Hardpan Table Mountain	1M	8A	8A	3M	MN	8A
144	Hunter Creek	1A	4A	7A	3A	4A	4A
146	Ishawooa Mesa	5A	5A	5A	5A	5A	5A
148	Leg Creek	1R	4A	4A	4A	4A	1R
150	Logan Mountain (138 Dunn Creek) (155 Trout Creek)	1A	7A	2B	7A	MN	7A
152	Pearson	3M	3M	8A	3M	3M	3M
153	Rattlesnake	3A	3A	5A	3A	3A	3A
154	Rock Creek	1M	7A	5A	7A	MN	7A
156	Valley/Boulder	7A	7A	7A	7A	7A	7A
157	Jim Mountain	4A	4A	6A	4A	MN	4A
159	North Absaroka Trans.	4A	5A	4A	4A	MN	5A
160	South Absaroka Trans.	4A	4B	4A	4A	MN	4B
161	Ishawooa Transportation	4A	2A	4A	4A	MN	5A
162	South Fork Transportation (165 Meadows Trans.)	5A	5A	5A	5A	5A	5A
163	Bench	1A	1A	4A	4A	1A	1A
164	Boulder Basin	2A	2A	3A	2A	MN	3A
166	North Fork (133 Blackwater) (136 Cow Creek) (139 Goff/Fishhawk) (141 Grinnell Creek) (147 June Creek) (149 Libby Creek) (151 Name It Creek)	1A	3M	3M	3M	3M	3M

TABLE II-16 (Continued)

FORPLAN Prescriptions Selected 1/

Analysis Area Number	Analysis Area Name 2/	Alternative A Current	 B Commodity	 C Non-Commodity	 D Preferred	 E Reduced Budget	 F RPA
WIND RIVER RANGER DISTRICT							
181	Dunoir (180 Doby Cliff)	9M	9M	9C	9M	MN	9C
182	Fish Lake	1A	1A	4A	1A	4A	1A
183	Horse Creek	3B	1A	7A	1A	1A	1A
184	Parque Creek (185 Ramshorn)	3D	3D	7B	3A	MN	3D
186	Red Creek	4C	4B	4B	4C	MN	4B
187	Union Pass	1C	7B	7B	1C	7B	7B
188	Warm Springs	3C	1B	7B	7B	MN	1B
189	Whiskey Mountain	5A	7A	7A	7A	MN	5A
190	Wiggins Fork	3B	1A	6C	6C	1A	1A
191	Wind River	3C	8B	8B	8B	8B	8B
192	Bear Creek	3M	7A	7A	7A	MN	7A
194	East Fork	4A	4A	5A	4A	4A	4A
195	Nine-Mile	3A	3A	3A	3A	MN	3A
196	Salt Creek	1B	1B	6B	1B	6B	1B
197	Simpson	4A	4A	4M	4M	MN	4A
198	Washakie	4A	4A	4A	4A	MN	4A
199	Dinwoody Recreation Horse	4A	4A	4A	4A	4A	4A

1/ Though the numbering of FORPLAN prescriptions is similiar to the numbering of Management Areas, note that this table is addressing FORPLAN prescriptions (see discussion of this table in the text)

2/ Shown in parenthesis are other grazing allotments included in the named analysis area.

TABLE II-17

Management Area Acreage Summary

Management Area	Management Emphasis	Alternatives					
		A Current	B Commodity Emphasis	C Non-Commodity Emphasis	D Preferred	E Reduced Budget	F RPA
1A	Developed Recreation Sites	2300	2300	2300	2400	2300	2300
1B	Winter Sports Sites	600	600	600	600	600	600
1D	Utility Corridors 1/	2500	2500	2500	2500	2500	2500
2A	Semiprimitive Motorized Recreation	130,000	70,000	155,000	185,800	102,000	75,000
2B	Rural and Roaded Natural Recreation	170,000	180,000	233,000	161,400	165,000	125,000
3A	Semiprimitive Nonmotorized Recreation	260,000	165,000	299,000	417,300	475,000	296,000
3B	Primitive Recreation	13,000	0	18,900	15,300	20,000	11,900
4B	Management Indicator Species	22,500	22,500	22,500	22,500	22,500	22,500
4D	Aspen Management 1/	5500	3800	4800	4500	2300	3400
4F	Grizzly Bear Enhancement	0	155,900	12,900	0	0	81,300
5A	Big Game Winter Range (Nonforested)	34,600	34,600	34,600	34,600	34,600	34,600
5B	Big Game Winter Range (Forested)	3800	3800	3800	3800	3800	3800
6B	Livestock Grazing	183,000	168,000	45,000	0	81,000	179,000
7C	Management of Steep, Forested Slopes 3/	0	6200	0	0	0	0
7E	Wood Fiber Production	182,200	204,700	145,000	174,300	50,500	169,700
8A	Pristine Wilderness	138,000	136,000	151,000	145,500	139,000	145,000
8B	Primitive Wilderness	714,000	759,000	708,000	896,000	592,000	715,000
8C	Semiprimitive Wilderness	556,000	513,000	549,000	314,900	677,000	548,000
8E	Glacier Addition to Fitzpatrick Wilderness	6700	6700	6700	6700	6700	6700
9A	Riparian Area Management 1/ 2/	31,200	31,200	31,200	31,200	31,200	31,200
9B	Water Yield Increase (Forested Areas) 1/	0	800	5000	0	0	800
9C	Water Yield Increase (Nonforested Areas) 1/	0	0	1280	0	0	0
9E	Water Impoundment Sites 1/	1200	1200	1200	1200	1200	1200
10A	Research Natural Areas	1680	1680	1680	1680	1680	1680
10D	Wild and Scenic Rivers	6660	6660	6660	6660	6660	6660
10E	High Lakes Wilderness Study Area	14,700	14,700	14,700	14,700	14,700	14,700
10F	Dunoir Special Management Area	28,800	28,800	28,800	28,800	28,800	28,800

1/ Acres are too small or scattered to be mapped at the planning map scale.
2/ Acre figure includes riparian areas, floodplains, lakes, and nonriparian wetlands.
3/ Acres too scattered and small to be mapped at the planning map scale; mapping of 7E includes some areas of 7C.

Water Quality and Wetlands

Sediment resulting from management practices is considered the most prevalent pollutant material in Forest streams. Project activities such as road building and use, vegetation management and soil disturbance will contribute sediment to adjacent streams. In some instances, short term reduction of water quality may violate State water quality standards. In other cases, where it may not be practical to build roads outside of wetlands or floodplains, Forest Service goals for water quality maintenance or enhancement may not be met (FSM 2520).

Grazing of domestic and transportation livestock in riparian areas could adversely affect the hydrologic and physical character of such areas and induce physical, chemical and biological changes in water quality. Developed and dispersed recreation can contribute to the same adverse effects. Some such impacts are unavoidable without comprehensive programs of monitoring and administration, and full time commitment of administrative personnel.

Minerals activities, including oil and gas, will produce some of the same adverse impacts as above, but in addition holds the potential for pollution by toxic or other hazardous materials. Spills and leaks of hazardous materials during development and production of oil and gas are unavoidable to a degree. In many areas of the Forest, spills and leaks would unavoidably affect water quality or wetland character.

Wildlife

Increased human activities in project areas may temporarily disturb or displace wildlife. Roads and road use may have a longer lasting impact on wildlife due to human activities associated with new access into areas previously unroaded and improved access into areas that previously had low standard nonsurfaced roads.

Mineral development will cause a direct loss of wildlife habitat on the Forest. This will not be a long-term effect, since measures will be taken to mitigate the loss of habitat following mining.

Fisheries

Road building and use, timber harvest and other ground disturbing activities will increase silt loads in streams which may temporarily displace fish, reduce trout reproductive success and alter aquatic microinvertebrate populations in stream sections receiving heavy concentrations.

Livestock Forage

Coal and uranium mining and gas and oil development will affect livestock forage for ten to fifty years as these acreages are removed from production. Mitigation measures will provide for establishment of forage on these areas to equal or exceed pre-mining levels.

Timber harvesting in areas that provide natural barriers to livestock movement may affect livestock distribution and control and could cause a need for additional range structural improvements.

Tree Stand Management

Some trees will be lost to mortality and other will not be harvested due to old growth requirements for wildlife, soil protection on steep slopes and other Forest Direction.

III. AFFECTED ENVIRONMENT

CHAPTER III

AFFECTED ENVIRONMENT

OVERVIEW

This chapter describes the environment of the Shoshone National Forest that would be affected by implementation of the proposed action and the alternatives. Forest conditions are described in the first two sections: Physical and Biological Setting, and Social and Economical Setting. A detailed review of current conditions and use, management and consumptive trends of Forest resources and support activities is presented in subsequent sections.

SUMMARY OF CHANGES BETWEEN DRAFT AND FINAL EIS

The only significant change made to this chapter was the addition of a section for wetlands and floodplains which occurs after the water resource section.

PHYSICAL AND BIOLOGICAL SETTING

The Shoshone National Forest is in the northern Rocky Mountains. These mountains consist of north to south trending ranges and include the Absaroka and Wind River Ranges, along and to the east of the Continental Divide.

Most of the Forest is within the upper Missouri River Basin, subdivided by the Wind, Big Horn and Clark's Fork River basins. The southern tip of the Forest is in the Sweetwater drainage which flows into the Platte River system.

The prevailing climate is categorized as "continental mountainous". Moisture is brought into the area by winds from the north and west. As moisture is lifted up and over the Continental Divide, it falls as rain or snow depending largely upon season and elevation. The average annual precipitation varies with topography and elevation, ranging from 15 to 70 inches. Projecting from available climatic data, the higher elevations receive from 30 to 40 percent of their annual precipitation during the winter in the form of snow, roughly 40 percent as rain and snow in the spring, and 20 to 30 percent as rain in summer and fall. In the lower elevations, seasonal distribution of precipitation shifts to a lower percentage of winter snow and a higher percentage of snow and rain during spring, summer and fall. Snowmelt and "rain-on-snow" events during the spring can produce floods; the duration, magnitude and timing of floods are generally unpredictable.

Snow accumulations are highly variable due to topography and microclimate. Heavy snow accumulations on steep slopes provide the potential for avalanches; many avalanche tracks are visible in the higher elevations of the Forest.

Variation in physical and biological characteristics of the Forest is a product of a wide range of geologic types, topographic features, and microclimates. Vegetation patterns, landforms, soil characteristics and wildlife habitat distribution can vary tremendously within short distances.

About 25 percent of the Forest is near or above timberline (about 580,000 acres). About one-third of these acres are high elevation plateaus and slightly dissected, broadly rounded mountain slopes. Another third of the alpine is comprised of steep dissected mountain slopes or glacial trough walls. The remaining third is comprised of glacial cirques and knife-edged ridges.

About 20 percent of the Forest can be classified as rockland (about 450,000 acres). These areas are very steep and are comprised of older glacial trough walls, highly dissected mountain slopes, or are large areas of uplifted mountain terrain. Rock outcrop comprises up to 30 percent of some landscapes.

About 35 percent of the Forest is comprised of low relief landforms (about 895,000 acres) including granitic uplands scoured by glacial ice, glacially scoured sedimentary landforms, valley bottoms, alluvial fans, large areas of landslide debris, and extensive deposits of glacial till. While these areas are quite heterogeneous, they usually have slopes less than forty-percent, and deep soils. About 125,000 acres or approximately 15 percent of this area is low enough or warm enough to support grassland or grass-shrub communities.

About 20 percent of the Forest is comprised of moderately dissected mountain slopes and uplifted sedimentary mountain slopes (about 508,000 acres). Slopes generally exceed 40 percent, but range from 30 to 90 percent. About 80 percent of this land type supports forested communities.

Although badlands comprise barely 0.1 percent of the Forest (about 5,000 acres), they have a unique landform, weak soil development, and an extremely high erosion rate, making them an important component of the forest ecosystem.

Most streams on the Forest are free-flowing. A major portion of the annual runoff occurs from May through July with a peak usually in mid-June. Late summer, fall and winter runoff is supported primarily by groundwater flows, including shallow alluvial aquifers that are recharged each spring. Portions of the Forest, notably the Beartooth Plateau and the higher elevations of the Wind River Range, contain numerous lakes, ponds and wetland areas. Water produced on the Forest is used for a variety of purposes, including irrigation, recreation, fisheries, hydroelectric power, industrial, municipal and domestic use.

Wildlife on the Shoshone National Forest is abundant in terms of populations and diversity of species. There are a total of 72 mammal, 230 bird, 9 reptile, 7 amphibian, and 19 fish species recorded for the Forest. Forty-eight species of birds and mammals are considered as "game animals".

Species of particular concern to the Shoshone National Forest are the endangered black-footed ferret (Mustela nigripes), bald eagle (Haliaeetus leucocephalus), American peregrine falcon (Falco peregrinus), Northern Rocky Mountain (gray) wolf (Canis lupus irremotus), and one threatened species, the grizzly bear (Ursus arctos horribilis).

The black-footed ferret has not been found on the Forest, but occurs three to five airline miles outside of the Forest boundary near Meeteetse, Wyoming. Bald eagles have been observed on various parts of the Forest; although no reported nesting has been observed, potential nesting and wintering areas have been mapped. The American peregrine falcon has been reported on a few occasions, but nesting is not known to occur on the Forest. The Wyoming Game and Fish Department has identified areas along the southern boundary of the Washakie Wilderness and in the Clarks Fork canyon as potential reintroduction sites for the peregrine. The presence of the gray wolf has not been confirmed in recent years, although there have been several sitings of large canids (dog-like animals) in the last decade, principally in the Greybull River drainage. Essential habitat for grizzly bears occurs in significant amounts (412,000 acres) on the Forest in association with adjacent portions of the greater Yellowstone area.

There are approximately 1,000 miles of perennial streams and about 7,900 acres of lakes and reservoirs on the Forest which provide good fish habitat. Fisheries have been increased primarily due to stocking programs by the Wyoming Game and Fish Department. Of the estimated 500 lakes on the Forest, the majority are located on the Beartooth Plateau, and in the Fitzpatrick and Popo Agie Wildernesses. Many of these lakes have not been stocked. Important fish species include Yellowstone and Snake River cutthroat, rainbow, German brown, brook and golden trout, mackinaw, and Arctic grayling.

VEGETATION

Vegetation within the Forest is classified into five broad communities: alpine; coniferous forest; montane meadow-parkland; sagebrush-grassland; and riparian.

Alpine

The alpine type consists mostly of herbaceous plants with low growth forms. It includes the true alpine and near alpine. The true alpine lies above timberline and is characterized by perennial herbaceous and shrubby low growing plants and mats of mosses and lichens. The near alpine occurs below the true alpine, and in addition to the above characteristics, may have of up to 15 percent coniferous trees. Alpine areas generally occur at elevations greater than 10,000 feet.

Conifers

Coniferous forests consist mostly of Douglas-fir and lodgepole pine (6,500 to 9,000 feet), and Engelmann spruce and subalpine fir (8,000 to 10,000 feet). Coniferous areas are characterized by continuous tree stands occuring below alpine and above sagebrush-grassland. Included are areas at least 15 percent forested with an understory of shrubs and herbs.

Montane Meadow-Parkland

Montane meadow and parkland vegetation consists of open areas occurring within the coniferous forest. The openings are not riparian or wetland in nature. Grasses and forbs are dominant and there may be up to 15 percent coniferous or deciduous forest canopy. Deciduous shrubs may also be present.

Sagebrush-Grass

Sagebrush-grasslands consist of dry grass and shrub communities generally occurring between 6,500 and 9,000 feet. Climax grasses and forbs occur in the understories, and shrubs (primarily sagebrush) comprise the overstories. They may have an overstory of up to 15 percent coniferous or deciduous trees.

Riparian

Riparian vegetation is water dependent, occurring in areas directly influenced by standing or running water or high water tables. Riparian vegetation is generally characterized by deciduous shrubs and trees (such as willow, aspen, rose, big sagebrush, and cottonwood) underlain by grasses, sedges and forbs.

ECONOMIC SETTING

The Forest encompasses parts of five counties of which there are significant acreages in only two. Therefore, consideration is made of two Economic Impact Areas (EIA's, see Figure III-1). Selection of these areas was based on how management of the Forest affects economic systems. The north half of the Forest directly influences Park County, and the south half of the Forest directly influences Fremont County. Refer to Table III-1 for projected population trends.

TABLE III-1

Population Trends 1970 to 2030

County	1970	1980	1984	1990	2000	2010	2020	2030
Park	17752	21456	23005	25881	31360	37998	46402	55788
Fremont	28342	39009	36101	41881	53082	67280	85275	108083

Sources:

Wyoming Population and Employment Forecast Report, Division of Research and Statistics, Department of Administration and Fiscal Control, State of Wyoming, Table I, June, 1979. Revised July, 1979.

Wyoming Progress Report, Department of Economic Planning and Development, State of Wyoming. September/October, 1984.

SOUTHERN ECONOMIC IMPACT AREA

Historically, the land in Fremont County has been used for agriculture, with ranching, livestock grazing on Federal lands, and irrigated farming as the major components.

The major employment sectors in Fremont County in 1980 were mining (26 percent), trade (20 percent), government (18 percent), and services (13 percent). The mining industry provided 40 percent of the personal income

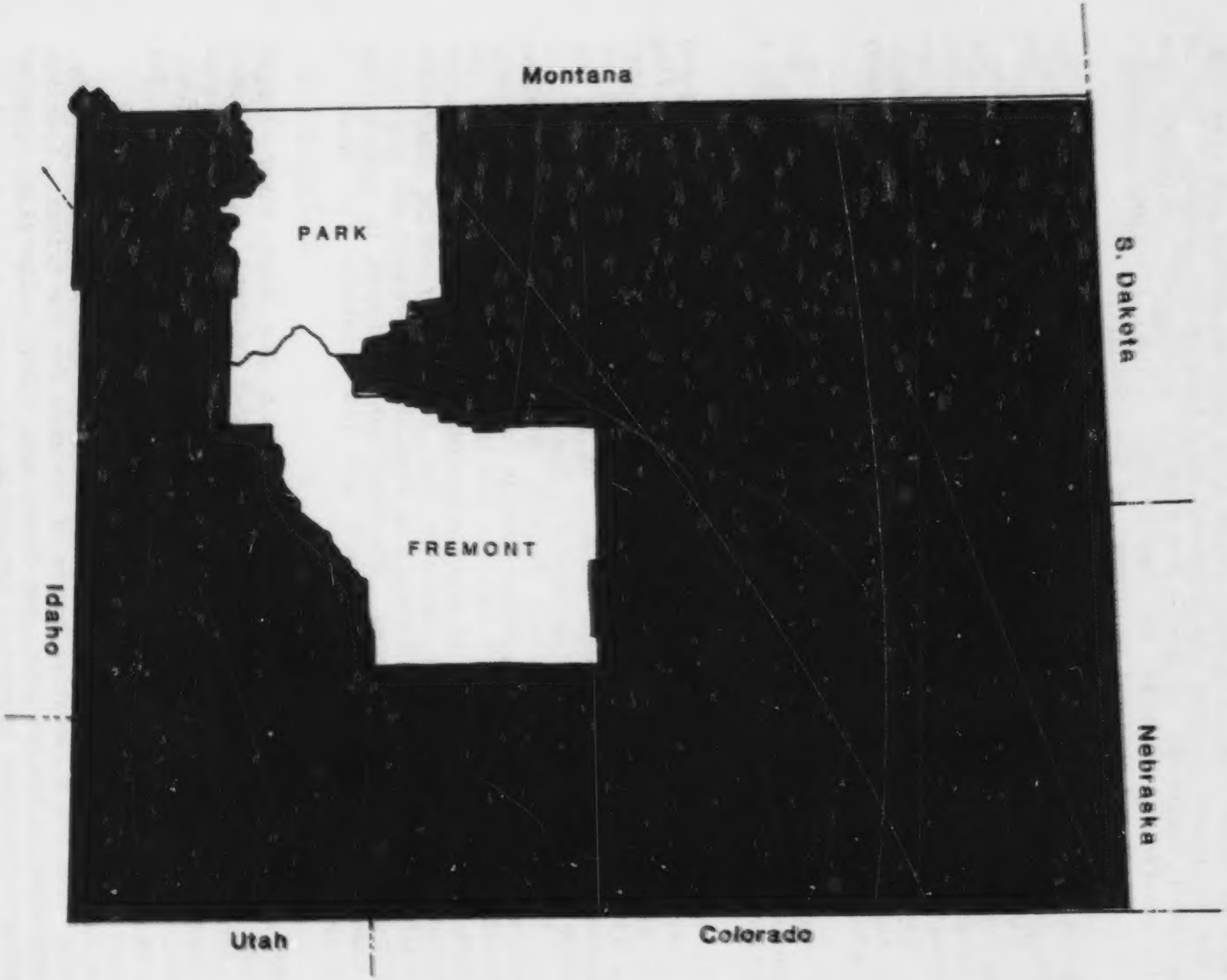

Montana
PARK
FREMONT
S. Dakota
Nebraska
Idaho
Utah
Colorado

FIGURE III-I Economic Impact Area
Shoshone National Forest

generated in Fremont County. This was followed by government (15 percent), service industry (13 percent), and trade (12 percent). Although agriculture is an important stabilizing influence socially, its dollar contribution to the local economy is a small percent compared to other sectors such as mining.

The Dubois area derives its main income from tourism, timber and livestock. Many of the businesses in town are dependent upon tourism for income. Many of the year-round residents of Dubois are directly or indirectly dependent upon the Louisiana-Pacific sawmill for employment. The livestock industry contributes income and seasonal employment to the community.

Many facets of the local economy are dependent upon the National Forest for existence, as a large proportion of the tourist activity takes place on the Forest. Winter recreation, primarily snowmobile use, is growing rapidly. A large portion of the local livestock industry depends upon the Forest for summer range to round out their operations. At the present time, the local timber industry procures virtually all its timber from National Forest System lands. There is very little timber on private lands and other public lands. Virtually all the water in the Wind River above its junction with Dinwoody Creek is produced on the Forest.

Economic sectors in the Riverton area include energy development, Federal and State agencies, retail sales, farming and ranching, and support services with a large portion of dollar outputs concentrated in the energy sector.

Lander is a regional medical center. Businesses are locally owned and operated, serving both Lander and Jeffrey City. Agriculture is a stabilizing influence with ranching and hay farming being important to the community. Ranching, though not a large employer in itself, provides a major source of self-employment in the agricultural sector. An important single sector of the labor market for the Lander/Riverton area is the mining and mineral-related activity. Major employers include Western Nuclear Inc., Pathfinder Mines Corp., Federal-American Partners, Union Carbide Corp., and Utah International, Inc. Retail trade and support services are the next largest sectors of the labor market with a large number of private businesses and employees in Lander and Riverton. The contracting industry has been experiencing increased activity with increased employment resulting from the development and expansion of the mining and mineral industries. The resultant employment in construction has more than doubled in the past two years and now accounts for about 10 percent of the employed labor force.

There are several oil and gas fields within the Wind River Indian Reservation. These energy resources are a significant element in the local economy. Annually, gross receipts from energy royalties on non-fee title lands on the Reservation is estimated at $23.6 million. Of this amount, approximately 85 percent or $20.1 million is paid to tribal members. The remainder is used to finance tribal activities and management.

Fishing on the reservation attracts non-Indians, both locally and nationally. The license fees are a lucrative source of revenues for the tribes. Tourists are also attracted to the pow-wows, sun dances and other culturally oriented events that are advertised as open to the public.

NORTHERN ECONOMIC IMPACT AREA

Park County is important in both oil and gas production. Tourism is an important seasonal industry with Cody's proximity to Yellowstone National Park, the presence of the Buffalo Bill Historical Center, and hunting on the Shoshone National Forest. Other industries are ranching, farming, and the mining and processing of gypsum and bentonite. The forest products industry has one major and several small sawmills employing less than 100 people. Marathon Oil maintains a headquarters in Cody.

Park County currently has a diverse, relatively stable economy although it relies heavily on oil and gas extraction as a source of revenue. Major employment sectors in 1980 were mining (including oil and gas production, 24 percent), trade (18 percent), services (16 percent), and agriculture (11 percent). In 1976, almost one-third of the dollar output was generated by mining, and this sector accounted for 20 percent of the employment within the county. In 1978, over 77 percent of the county tax evaluation was provided by companies involved in oil and gas production. Though oil and gas production has declined, increased exploration activities appear to be compensating for this decline. Agriculture, manufacturing, and recreation and tourism are the other three basic industries that contribute to the economic base of the county. Retail and wholesale trade, business and personal services, and local governments are all supported by the basic economic sectors within the community.

EXPENDITURES AND RETURNS

The fiscal year 1982 budget for the Forest was $2.741 million including capital investments and general administration. This figure does not include $.5 million spent on a nonbudgeted, extraordinary capital investment during that year. Table III-2 shows a general breakdown of budgeted items. The total 1982 budget falls into the range of averages for the Forest, albeit on the low side. Table III-3 shows 1982 receipts for the Forest.

By law, a portion of the revenues collected by the Forest Service are returned to the State of Wyoming to be used for schools and roads in the counties where National Forest System lands are located. Table III-4 shows the fiscal year 1983 payments to Wyoming for distribution to counties.

SOCIAL SETTING

When Forest Planning began on the Shoshone National Forest, areas affected by the Forest were subdivided into 5 human-geographic areas called Human Resource Units (HRU's, see Figure III-2.) Each of these units displays unique cultural, economic, and social characteristics. Because of this, they provided a means to organize data concerning the social environment of the Forest. Information concerning each of these areas was collected and is documented in a booklet titled "Human Resources Unit Descriptions - Shoshone National Forest 1981". This information continues to be updated.

While HRU's provide a means for organizing data on social systems, it is difficult to quantify social impacts for each HRU. Quantification of impacts and analysis of those impacts can be done by examining a larger geographic area. Delineation of these larger areas was based on how management of the

TABLE III-2

1982 Budget Items

Budget	1982 Dollars
Facilities	$1,207,300
Recreation and Wilderness	424,400
Range	242,755
Timber	223,445
Wildlife and Fish	209,100
Protection	118,079
Watershed and Soils	107,900
Minerals	95,900
Lands	82,500
Human Resource Programs	30,000
Total	$2,741,379

TABLE III-3

1982 Forest Receipts

Receipt Item	1982 Dollars
Administrative User Fees	$ 86,200
Grazing	82,100
Recreation	79,800
Minerals	79,700
Timber	33,600
Land Uses	10,300
Power	400
Total	$372,100

TABLE III-4

1983 Payments

County*	Payment in 1983 Dollars
Park	$ 94,600
Fremont	52,600
Total	$147,200

* Payments of $3,300, $600 and $100 were made to Hot Springs, Sublette and Teton Counties respectively.

Forest directly affects social systems. Two such social impact areas (SIA's) were defined. The first, represented by Fremont County, is directly affected by management of the south half of the Forest and combines the Wind River, Wind River Indian Reservation and Lander/Riverton HRU's. The second, represented by Park County, is directly affected by management of the north half of the Forest and combines the Beartooth and Bighorn Basin West HRU's. These SIA's also correspond to the economic impact areas and thereby provide a mechanism for linking social and economic impact analysis.

SIA's are the basis for analysis and presentation of social impacts. Impacts for sub-areas will be discussed when such impacts are significant.

SOUTHERN SOCIAL IMPACT AREA

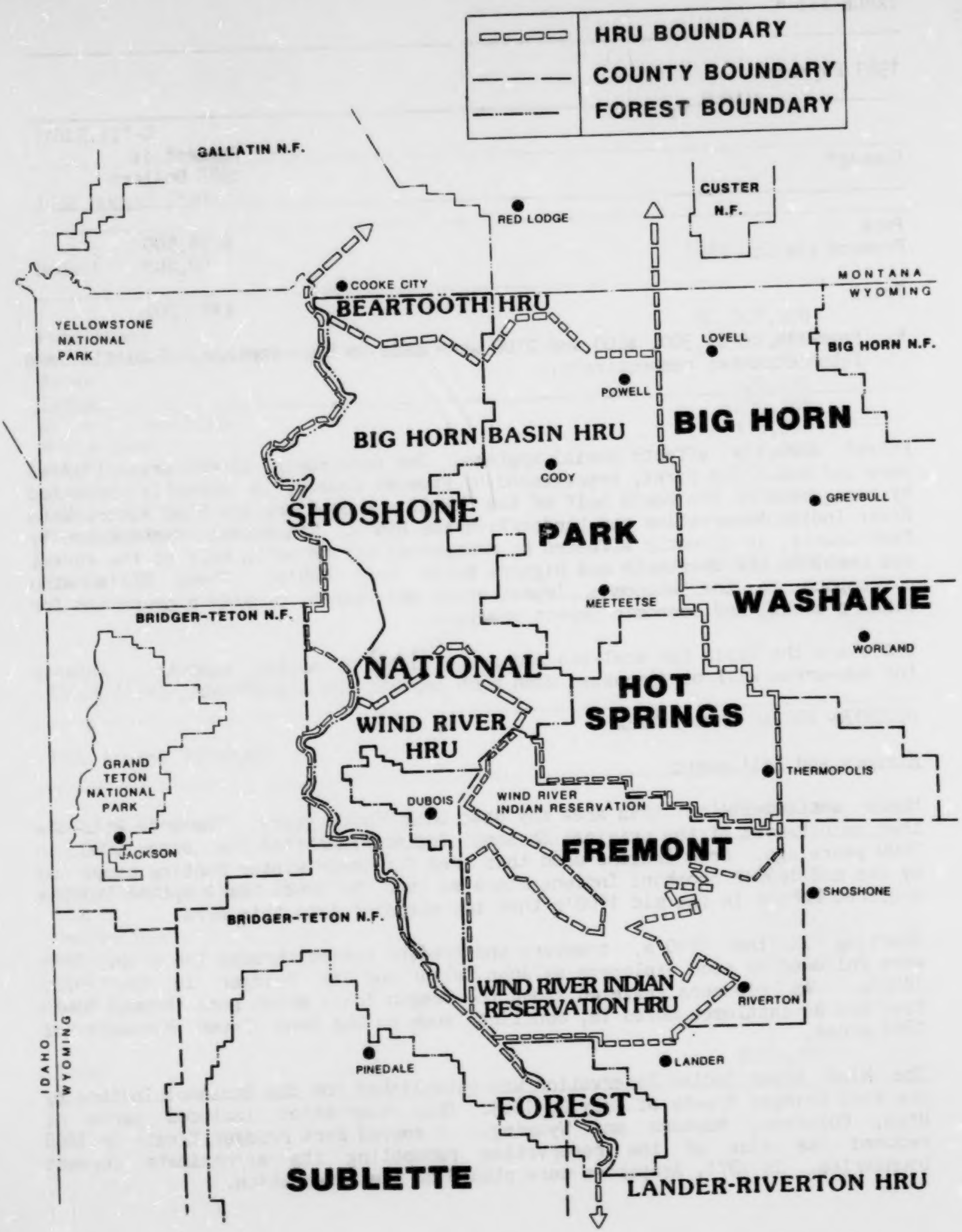
History and Settlement

Human settlement of this area may date back 10,000 years. There is evidence that an offshoot of the original Shoshoni Indians inhabited the area 6000 to 7000 years ago. Crow Indians used this area for their winter hunting camps and by the mid 1600's Shoshoni Indians migrated into the area. As Arapahoe Indians acquired horses in the mid 1700's they too migrated into this area.

Starting in the 1740's, trappers and traders passed through the area. They were followed by such explorers as John Colter and Jim Bridger in the early 1800's. As pioneers traveled along the Oregon Trail which goes through South Pass and as cattlemen moved in, conflicts such as the Sand Creek Massacre of 1864 arose.

The Wind River Indian Reservation was established for the Shoshoni Indians by the Fort Bridger Treaty of July 2, 1863. This reservation included parts of Utah, Colorado, Montana and Wyoming. A second Fort Bridger Treaty in 1868 reduced the size of the reservation resembling its approximate current boundaries. In 1871, Arapahoes were placed on the reservation.

FIGURE III-2 Shoshone National Forest Planning Area


HRU BOUNDARY
COUNTY BOUNDARY
FOREST BOUNDARY
GALLATIN N.F.
RED LODGE
CUSTER N.F.
COOKE CITY
MONTANA
WYOMING
BEARTOOTH HRU
YELLOWSTONE NATIONAL PARK
LOVELL
BIG HORN N.F.
POWELL
BIG HORN
BIG HORN BASIN HRU
CODY
GREYBULL
SHOSHONE
PARK
MEETEETSE
WASHAKIE
BRIDGER-TETON N.F.
WORLAND
NATIONAL
HOT SPRINGS
WIND RIVER HRU
GRAND TETON NATIONAL PARK
THERMOPOLIS
DUBOIS
WIND RIVER INDIAN RESERVATION
JACKSON
FREMONT
SHOSHONE
BRIDGER-TETON N.F.
WIND RIVER INDIAN RESERVATION HRU
RIVERTON
IDAHO
WYOMING
LANDER
PINEDALE
FOREST
SUBLETTE
LANDER-RIVERTON HRU

A gold strike in 1868 at South Pass brought over 2000 people into the area. A settlement at South Pass was established and in 1870 a Fort was established there. Other settlements were also established at this time.

Cattle operations moved into the Wind River valley in the late 1800's and by 1880, settlements to support cattle operations were established in the Dubois area. With the railroad moving through this area and a railhead at Shoshoni, there was a need for railroad ties. Tie hacking on the Forest and neighboring areas began in 1905 and continued through 1947. Also in 1905 much of this area was opened to homesteading.

Mineral development began in the early 1900's and by 1917 coal mining operations around Hudson were well established. Oil and gas development began in the 1920's to be joined later by uranium developments in the mid 1950's.

The Shoshone National Forest was originally part of the Yellowstone Timberland Reserve created by Presidential proclamation of March 30, 1981. Pursuant to the act of March 4, 1907 (34 Stat. 1256), the Wind River Division and the Shoshone Division of the timberland reserve became identified as the Bonneville and Shoshone National Forests, respectively. On May 10, 1910, the Bonneville was divided into three divisions. By Executive Order of the President, the Wind River District was added to the Sweetwater Division of the Bonneville National Forest on June 30, 1911. On July 1, 1912, the Sweetwater Division became the Washakie National Forest. In 1945, the Washakie National Forest was made a part of the Shoshone National Forest.

Lifestyles

The Dubois area derives its main income from tourism, timber and livestock. Many of the businesses in town are dependent upon tourists for income. Many of the year-round residents of Dubois are directly or indirectly dependent upon the Louisiana-Pacific sawmill for employment.

Riverton is the largest "energy town" in Fremont County. Economic sectors in the community include energy development, Federal and State agencies, retail sales, farming and ranching, and support services with a large portion of dollar outputs concentrated in the energy sector.

Lander is a regional medical center. Businesses are locally owned and operated, serving both Lander and Jeffrey City. Agriculture is a stabilizing influence with ranching and hay farming being important to the community. An important single sector of the labor market for the Lander/Riverton area is the mining and mineral-related activity. Retail trade and support services are the next largest sectors of the labor market with a large number of private businesses and employees in Lander and Riverton. Ranching, though not a large employer in itself, provides a major source of self-employment in the agricultural sector.

Ranching and farming are the predominant ways of life in the rural areas of Fremont County. Most of the ranch and farm families can be characterized as people who are independent and hard-working, and place a high value on solitude.

Dude ranches, lodges and outfitters and guides provide an "old west" atmosphere. An independent spirit and reverence for the out-of-door's pervades the lifestyles of those involved in these operations.

Permanent residents of urbanized areas of the county often live there because of the areas' rugged beauty and recreational opportunities. Most enjoy and participate in such activities as hunting, fishing, camping, packing through the wildernesses, and snowmobiling. Getting outdoors and participating in such activities is a focal point of life.

A large faction of the mining and related work sectors are young or transient people with ample financial resources available for recreational activities. During their off-time, these people like to do a lot of "4-wheeling", and find the Forest to be the kind of place they are seeking.

The family, tribe and community in which the Indians reside are strong social units within the Wind River Indian Reservation. Recreational activities revolve around the Arapahoe-Shoshone Tribal Council Entertainment Committees and the three communities of Fort Washakie, Ethete and Arapahoe.

The Reservation functions as a closed society. However, there are two distinct groups separated along tribal lines within the reservation: the Shoshone Indians are concentrated in the west part of the Reservation at Fort Washakie, Ethete and Lander; the Arapahoes reside in the eastern areas at Riverton, St. Stephens and Arapahoe.

Settlement patterns on the Reservations have been stable for the last 50 years due to the lack of job opportunities. Many Indians have poverty-level incomes. To supplement their incomes, Indians would have to leave the Reservation. Many are not willing to leave their homes and communities.

Hunting and fishing on the Reservation are becoming recreational activities in addition to a means of obtaining food. The Indians, however, utilize their own lands including the Wind River Roadless Area that extends to the Continental Divide. They seldom use any part of the Shoshone National Forest. More Indians today own four-wheel drive vehicles than in the past, a trend that will probably continue. Fishing on the reservation attracts non-Indians, local and national. The license fees are a lucrative source of revenues for the tribes. Tourists are also attracted to the pow-wows, sun dances and other culturally oriented events that are advertised as open to the public.

Population and Land Use

The county population increased 8.3 percent between 1960 and 1970, and 42 percent (to 40,251) between 1970 and 1980. The county's population is projected to reach 47,800 in 1985 and 52,350 by 1990. In 1980, the county's population was 87 percent white, 11 percent Indian, and 3 percent Spanish surnamed.

Approximately 53 percent of Fremont County is Federal land, 5 percent is State land, 14 percent is private/county/municipal, and 28 percent is under non-Federal BIA jurisdiction. Of the Federal lands, about 31 percent is administered in the National Forest System.

The permanent Dubois population is approximately 1,200 people and is projected to increase to 1,600 by 1990. Lander's population increased from 7,125 in 1970 to 9,126 in 1980. The population of Riverton increased from 7,995 in 1970 to 9,588 in 1980, a 19.5 percent change for the ten-year period. The increase in population was due primarily to energy resource development.

The Reservation population is approximately 6,950. Of this population, approximately 2,950 are Shoshones and 4,000 are Arapahoes. The population within the Reservation is growing slowly, with no significant change in recent years. The rate of increase will probably remain constant for the next ten years.

Most lands in private ownership belong to ranchers, outfitters or dude ranchers. These owners vary in type from wealthy absentee landowners to operators endeavoring to build up their incomes. Some owners are outfitters operating from their private lands or campsites on the Forest.

Attitudes, Beliefs and Values

Residents in this area have divergent attitudes, beliefs and values. Four distinct groups appear to exist.

One group favors strong, independent action with little government control except on public lands. On public lands they press for controls to protect the rugged, wild character of the Forest that they feel is part of the local heritage.

A second group believes strongly in economic development activities and material use of resources. This group tends to view the Forest as a source of raw material to fuel their economic enterprises. Members of this group often relate such activities to the viability and stability of communities.

Though opposites in terms of their views on how Forest resources should be used, both of these groups tend to have a land ethic that relies on long term management of resources.

A third group tends to focus on hard work and hard play. Members of this group appear to view the Forest as a play area and have no long term commitment to its development or use. Unlike the first two groups, this group is also not heavily involved in formal social organizations or community betterment projects.

The fourth group is comprised of the Indian segment of the population. The Indian heritage fosters a strong set of attitudes, beliefs and values regarding resource uses both on and off the Forest.

Social Organization

Social services are limited for rural residents. Smaller communities have little capacity to absorb a population increase of any size. Law enforcement and fire protection is provided by the County and is augmented by such services available in the larger urban areas. Rural residents rely on medical facilities located in the larger urban areas of the County. The electrical distribution systems could not accommodate a surge in rural population without increasing the present capacity. Most rural residents have their own wells and springs for domestic water.

Urbanized areas, including Lander, Riverton and Dubois, provide police protection, fire departments, schools and other social services for their residents. Many of these services, including medical services, are open to rural residents as well. All urban areas appear capable of absorbing a moderate amount of growth as evidenced by their response to boom periods of the recent past. Beyond that, Dubois has many of the municipal services expected for a town much larger than it's 1,200 people. This is primarily due to the summer recreation industry which brings in many tourists and summer residents.

All communities have a wide variety of social organizations including Church groups, community betterment groups, and various guilds. These groups provide for socialization, dissemination of information, and services to their members.

Facilities such as schools, police and fire departments exist on the Reservation. Because of the close family and community relationships on the Reservation, there is no apparent need for such social services as half-way houses, homes for the elderly or orphanages.

Few formal social networks occur on the Reservation. Rather, considerable value is placed on informal networks, family relationships and traditional religions.

NORTHERN SOCIAL IMPACT AREA

History and Settlement

Human settlement within the Big Horn Basin dates back over 12,000 years. As in Fremont County, there is evidence of human settlements dating back 6000 to 7000 years. These inhabitants were the Mountain Shoshoni (referred to as Sheepeater) Indians who occupied the mountains on the Forest and migrated with wildlife herds. Shoshoni, Arapahoe and Crow Indians were encountered here in the early 1800's by traders, trappers, and such explorers as John Colter and Jim Bridger. The period from 1820 to 1830 was an active one for fur trappers and traders, but most of the activity had died out during the 1840's. By the late 1800's cattle operations were moving in. Gold and silver attracted people during the 1870's. By 1878 there were cattle ranches, hunting camps and dude ranches in operation.

During the period of 1890 to 1902, several irrigation projects were begun. In this period, sawmills that supported development were established throughout the area. By this time mining, ranching, hunting, trapping and logging were the major economic activities.

Colonel William F. "Buffalo Bill" Cody first entered the Big Horn Basin in the 1870's. The Colonel and several friends came to the area with the avowed purpose of land development and building a community. The town of Cody was founded in 1897 and was incorporated by 1902.

To bolster the economy of the struggling new town, Colonel Cody persuaded his friend, President Theodore Roosevelt, to have the Bureau of Reclamation build the Shohone Dam and Reservoir, later renamed the Buffalo Bill Dam and

Reservoir. With the completion of this dam, the highest in the world at the time, the community was established soundly in the irrigation and electric power fields.

Powell has its roots in reclamation. The city was named after Major John Wesley Powell, the distinguished head of the U.S. Geological Survey and father of the Bureau of Reclamation. The area around Powell, in 1888, became part of a project sponsored by the U.S. Geological Survey to investigate the practicality of irrigating parts of the public domain through the use of reservoirs, canals, and hydraulic works. Water became available to settlers in 1908 when Buffalo Bill Dam was completed. In 1909, the town was incorporated and became part of the newly organized Park County in 1910.

The northern portion of the Shoshone National Forest was first a part of the Yellowstone Timberland Reserve created in 1891. In 1908, it was split off as the Shoshone National Forest.

Irrigated farming, cattle ranching, tourism, hunting and timbering all worked together to support growth in the early 1900's. This was greatly augmented during the 1920's by oil and gas developments such as the Oregon Basin Oil field. This pattern of growth has continued until today.

Lifestyles

Lifestyles, though affected by economic activites, focus on outdoor pursuits. Most residents choose to live in this area because of the recreational opportunities available. These include hunting, fishing, snowmobiling and use of wilderness areas for hiking and horseback riding. Yellowstone National Park, which lies within this area, contributes to the outdoor oriented lifestyle.

Park County has a diverse, relatively stable economy although it relies heavily on oil and gas extraction as a source of revenue. In 1976, almost one-third of the dollar output was generated by mining, and this sector accounted for 20 percent of the employment within the county. In 1978, over 77 percent of the county tax evaluation was provided by companies involved in oil and gas production. Though oil and gas production has decreased recently, exploration activities have greatly increased over the last four years. Agriculture, manufacturing, and recreation and tourism are the other three basic industries that contribute to the economic base of the county. Retail and wholesale trade, business and personal services, and local governments are all supported by the basic economic sectors within the county.

Trades, services, and recreation and tourism together rank second in employment. Agriculture contributes about 10 percent of the area's output in dollars.

Employment projections indicate that unemployment will continue below the National average. Generally speaking, jobs paying good salaries are available primarily in conjunction with the oil and gas industry. Unemployment is currently 7.2 percent.

The Shoshone National Forest is a focal point for recreational activity for many residents in this county. Leisure time for many county residents is available on weekends year-round rather than seasonally as might be expected in more agriculturally oriented areas. Hunting, fishing, camping, picnicking, sightseeing, horseback riding, backpacking, skiing, snowmobiling, snowshoeing and numerous other recreation pursuits are enjoyed by Forest visitors.

Population and Land Use

The population of Park County in 1980 was 21,639. It increased 5.4 percent between 1960 and 1970, and 21.0 percent between 1970 and 1980. It is projected to reach 23,346 by 1985, and 24,942 by 1990. Few minorities live in Park County. In 1980, the population was 98 percent white.A majority of Park County residents are not "natives", but have moved to the area within the last 20 years.

Approximately 79 percent of Park County is federal land, four percent is state land, and 17 percent is private land. Of the federal lands, about 65 percent is in the National Forest System.

The population of Cody in 1980 was 6,790. The population has grown at a moderate rate, with a 31.6 percent increase from 1970 to 1980, primarily due to increased oil and gas, and recreation and tourism activities.

Powell is a stable community of approximately 5,000 serving a large agricultural area. The population of Powell increased from 4,807 in 1970 to 5,310 in 1980, a 10.5 percent increase. The growth is primarily attributed to the new oil and gas-related businesses located in Powell.

Meeteetse has about 540 residents. Although it was orginally a ranching community, oil and gas production has been on-going in the area for the past 30 to 40 years. Very few people move into the town because of the lack of available housing and the inability of the community to expand its land base.

Attitudes, Beliefs and Values

With the relatively low number of people dependent on the Forest for their livelihood, the belief that resources of the Forest should be developed with a long term view point appears to be missing in this area. Rather, residents appear to be in one of two very polarized camps: (1) those who would like to see resources such as oil and gas developed with few controls; and (2) those who would like to have little or no development, thus preserving the wild character of the Forest. Both of these viewpoints appear to be strongly represented in most public forums dealing with management choices for the Forest.

The inherent value system in this area is one which favors unbridled free enterprise off the Forest. A land inventory has been completed as a first step toward developing guidelines for future development of private lands.

While favoring little or no controls on development and activities off the forest, many residents look to the Forest as their area to "get away from it all". They often return to the same areas year after year for pack trips, camping, fishing and hunting. They are concerned whenever anyone suggests changing the character of an area. This concern is even higher within a large contingent of outfitters and guides, who derive their livelihood from guiding tourists through the rugged beauty of the Forest.

Another group of residents appear to agree with placing little or no controls on economic activities on or off the Forest. While they share the view that the Forest is a beautiful place, they feel that economic development, continued growth, and the health of local economic and social systems depends on full development of the resources of the Forest, particularly the mineral resources.

Social Organizations

All communities in Park County appear stable in that they are growing at a rate which can be accommodated by existing support services. Such growth is apparently not disruptive to community social and economic structures. Support services such as law enforcement, fire fighting and education are all well established and available. Medical services are generally available, with the hospitals in Cody and Powell supporting those needs of the county.

There are many social, religious and professional organizations which provide for social needs. There are well defined formal organizations as well as many informal networks which provide social services and serve as communication networks.

RESOURCE ELEMENTS

RECREATION

Each year the Shoshone National Forest provides about one million recreation visitor days (RVDs) of outdoor recreation enjoyment to the public. This use occurs in dispersed areas, developed sites and wilderness.

Dispersed recreation occurs on lands outside of developed sites. Wilderness dispersed recreation opportunities and use are discussed in a separate section following RECREATION. Dispersed recreation outside wilderness traditionally makes up about 52 percent of the total Forest recreation use. Visitors may travel on horseback, foot, skis, snowshoes, snowmobiles, motorcycles, autos, and four-wheel or all terrain vehicles. They engage in recreation activities such as backpacking, hiking, tent camping, fishing, hunting, mountain climbing, photography, auto-touring, four-wheeling, firewood gathering, Christmas tree cutting, or just enjoying the scenery unique to the Shoshone National Forest.

Developed recreation is activity that occurs in areas built especially for support of outdoor recreation opportunities, such as campgrounds, picnic areas, downhill ski areas, trailheads, resorts, lodges, and interpretive service centers or sites. On the Shoshone National Forest, developed recreation use makes up about 34 percent of the annual total. Recreation use of Wilderness makes up the remaining fourteen percent of the annual use on the Forest (see WILDERNESS section below).

Forest planning for recreation opportunities incorporates the use of the Recreation Opportunity Spectrum (ROS), as described in the ROS Users Guide (USFS, 1981). The ROS was specifically developed to enable the integration of outdoor recreation principals and guidelines into overall multiple use resource plans. Underlying the ROS system is the concept that quality recreation experiences are best assured by providing a diverse set of recreation opportunity settings. The assumption made in planning and management actions using the ROS is that recreation users engage in chosen activities in preferred environmental settings which have a combination of physical, social and managerial characteristics which will enable them to realize their expectations.

For planning and management consistency, the settings have been described along a continuum. The ROS continuum is divided into six classes: primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural and urban. The definitions of these classes are found in the Glossary, Chapter VII. The current composition of ROS classes throughout the Forest and the relative use by ROS class is shown in Table III-5.

The 1980 Wyoming State Comprehensive Outdoor Recreation Plan (SCORP) states that residents and out-of-state visitors' first choice for seeking recreation opportunities is on public lands, regardless of recreation opportunities available on other lands. This indicates that the opportunities provided by the Shoshone National Forest will normally be used before those provided by adjacent private lands.

TABLE III-5

ROS Composition on the Shoshone National Forest (Including Wilderness)

Class	Acres	Percent of Forest
Rural (R)	23,000	1
Roaded Natural (RN)	288,000	12
Semiprimitive Motorized (SPM)	358,000	15
Semiprimitive Nonmotorized (SPNM)	928,000	38
Primitive (P)	834,000	34

The SCORP recognized that the National Forest plays a significant role in providing a well balanced and broad range of outdoor recreation opportunities both for Wyoming residents and for nonresidents. The State's growing tourist industry is primarily based on the presence and availability of high quality outdoor recreation resources, diverse wildlife habitats and abundance of historic sites and areas. The SCORP indicates that one-half to three-quarters of the total use of outdoor recreation resources in Wyoming is by nonresidents and that the single most important variable in anticipating future demand (use) is the price and availability of fuel.

The SCORP also states that in the past, the State has been a "junior partner" with the Forest Service, Park Service and Bureau of Land Management in providing developed recreation opportunities. However, this role is changing as the State Park System is developing and federal recreation facility development remain constant. It is anticipated that the State will play an increased role in providing needed developed recreation opportunities.

Cooperative agreements have been entered with State and county governments to provide snowmobile opportunities. The Wyoming Recreation Commission has initiated a trail-grooming program under agreement with the Shoshone National Forest.

Other relationships with the public and private sector in providing recreation opportunities involve agreements with the BLM and private landowners to provide access to the National Forest. Most of these agreements are informal; the Forest coordinates road closure, maintenance, and signing programs to meet the management needs of both the National Forest and adjacent landowners or managers.

Dispersed Recreation (Other than Wilderness)

Current Use and Management. Nonwilderness dispersed recreation use occurs on about 1,054,000 acres of the Forest. The total average annual dispersed use from 1972 to 1981 was 407,000 RVDs. Figure III-3 illustrates the ROS composition in dispersed areas and the percent use by ROS class.

Dispersed recreation areas on the Shoshone National Forest are in reasonably good condition. Some of the concentrated use areas along roads, trails and areas of traditional use have experienced some resource degradation but are not at levels beyond rehabilitation. Very few dispersed use sites have been improved recently, and heavier use of traditional sites is notable. This is attributed to the centering of increased fishing, hunting and hiking activities around these sites. Dispersed sites recently inventoried as having resource degradation problems are the same sites identified by managers twenty to thirty years ago. This indicates that local resource degradation levels are remaining constant or are degrading at a very slow rate.

Public motorized travel on roads and trails is occuring for a variety of purposes, including access for dispersed recreation activities, hunting, gathering firewood, sightseeing and access to private property. Road rights-of-way for Forest access (particularly on the Lander, Wind River and Greybull Ranger Districts) are lacking. Currently, the capacity of the Forest to provide motorized recreation opportunities exceeds use; however, if rights-of-way are not obtained, adjacent landowners may close roads to public use and significantly curtail motorized recreation opportunities.

Off-road vehicle (ORV) use does not represent a major percentage of total recreation use on the Forest. Because of the rugged terrain, amount of wilderness, and availability of challenging primitive roads, most users of motor bikes and 4 X 4's limit use to designated routes. Snowmobilers are the major off-road vehicle users on the Forest. In those areas where terrain and vegetation allow for off-road use by wheeled vehicles, some resource damage has occurred.

A major factor influencing the use of Forest resources for dispersed recreation is the Forest Travel Management Plan. Motorized recreation use on the Forest is currently managed according to the Shoshone National Forest Travel Map.

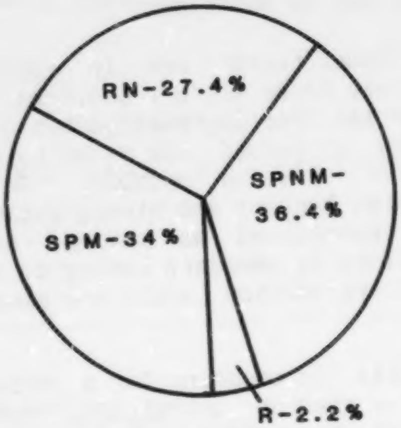
FIGURE III-3

Dispersed Recreation Current Production Levels (Excluding Wilderness)

R - Rural
RN - Roaded Natural
SPM - Semiprimitive Motorized
SPNM - Semiprimitive Nonmotorized
P - Primitive

PERCENT DISPERSED ACRES BY ROS CLASS

(Current total dispersed area is 1,051,900 acres)



PERCENT USE BY ROS CLASS (RVD's)

(Total average annual dispersed use, 1972-1981, 407 MRVDs)

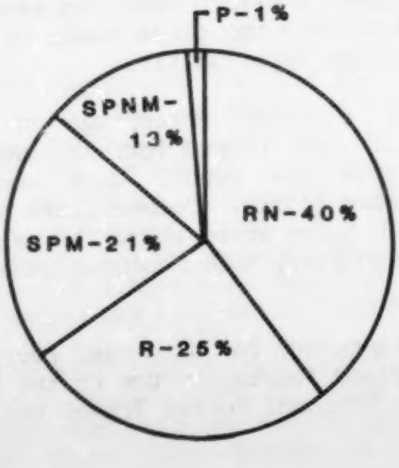
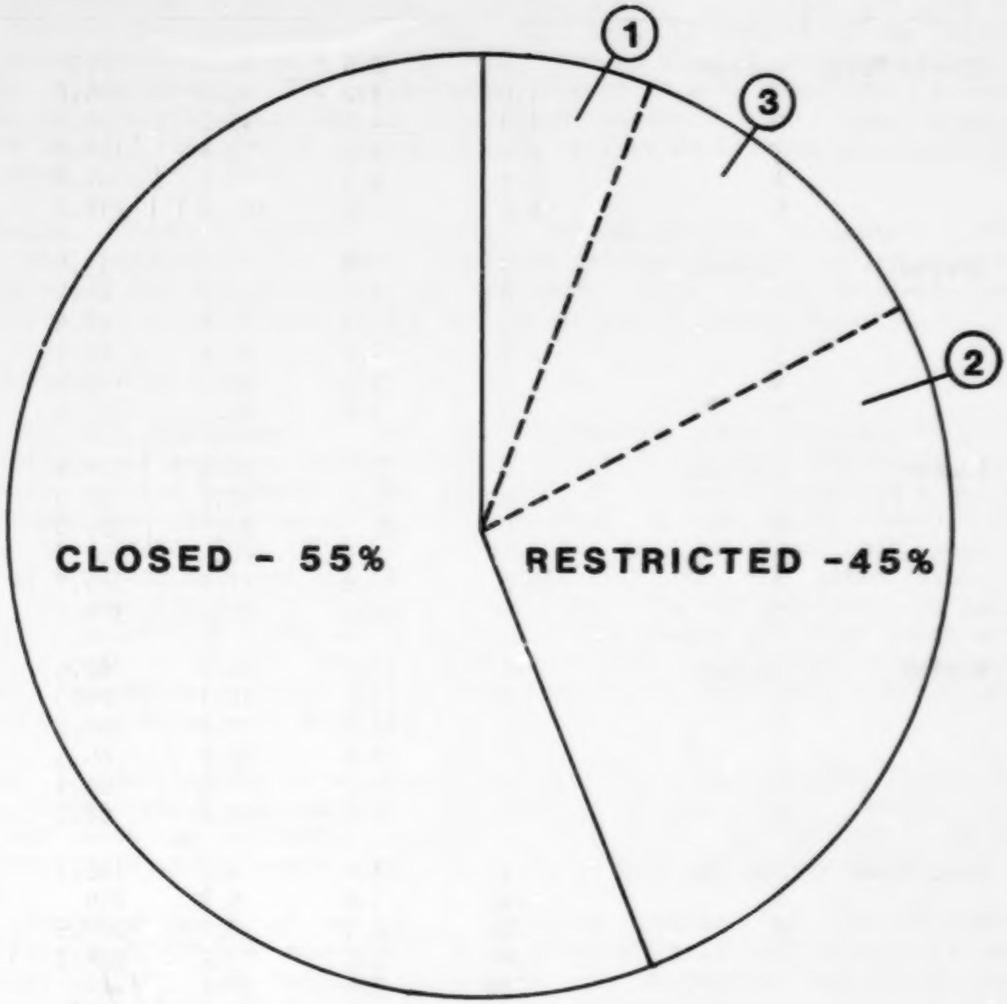


FIGURE III-4 Travel Management



① Area closed year-long to motorized travel off Forest roads except snowmobiles operating on snow (36 CFR 261.56).

② Area closed year-long to motorized travel off Forest roads except trail vehicles operating on Forest trails and snowmobiles operating on snow (36 CFR 261.56).

③ Area closed year-long to motorized travel off Forest roads except trail vehicles operating on Forest trails (36 CFR 261.56).

TABLE III-6

Use Trends for Dispersed Recreation in Average Annual Thousands of RVDs

Ranger District	Planning Period	P	Recreation Opportunity* SPNM	SPM	RN	R
Clarks Fork	Current	.8	2.5	42.3	18.2	4.8
	1	1.0	3.2	43.0	126.8	5.1
	2	1.4	4.5	55.0	144.5	5.7
	3	2.1	6.4	78.4	164.8	6.4
	4	3.1	9.3	111.7	187.8	7.2
	5	4.6	13.0	159.2	214.2	8.0
Greybull	Current	0	.8	17.3	33.6	0
	1	0	1.0	24.0	45.9	0
	2	0	1.1	32.6	62.4	0
	3	0	1.2	44.4	84.9	0
	4	0	1.3	60.4	115.5	0
	5	0	1.5	82.1	157.0	0
Lander	Current	0	17.1	38.9	114.4	35.4
	1	0	20.8	42.7	128.9	39.7
	2	0	25.1	50.8	159.8	48.8
	3	0	30.5	60.5	198.1	60.0
	4	0	36.8	71.9	245.7	73.9
	5	0	44.6	85.6	304.7	90.9
Wapiti	Current	0	11.1	21.7	62.5	302.3
	1	0	11.7	38.1	63.0	306.2
	2	0	12.6	57.2	64.3	315.4
	3	0	13.6	85.7	65.5	324.8
	4	0	14.7	128.6	66.9	334.6
	5	0	15.9	192.8	68.2	344.6
Wind River	Current	.35	1.4	4.2	166.1	0
	1	.43	1.6	5.3	219	0
	2	.54	2.1	8.1	249.5	0
	3	.68	2.7	12.2	324.3	0
	4	.86	3.4	18.6	426	0
	5	1.1	4.4	28.3	548.1	0

* P - Primitive
SPNM - Semiprimitive Nonmotorized
SPM - Semiprimitive Motorized
RN - Roaded Natural
R - Rural

Presently, 45 percent of the Forest is open with restrictions on motorized use and 55 percent is closed (wilderness, ski areas, wildlife and other closures). Figure III-4 illustrates these percentages and provides further information on types of restriction. Information on miles of Forest roads and trails is found in the Facilities section of this chapter.

It appears that recreationists seeking a nonmotorized experience away from roads tend to focus on the designated wilderness rather than experiencing similar opportunities in nonwilderness dispersed areas. Following are several factors influencing this pattern of use. More than 50 percent of the Forest is designated wilderness. As a result, users tend to plan their visits to well publicized wildernesses. The wilderness resource is well distributed across the Forest with each District having wilderness acreage. The nonwilderness areas are usually rugged with limited access, or provide limited opportunities for solitude.

Demand Trends. Based on current dispersed recreation use estimates, user origins, and projections for local, state and national populations, dispersed recreation use trends are projected to increase. Table III-6 displays the dispersed recreation use trends by ROS categories and by Ranger District.

Developed Recreation

Current Use and Management. Developed recreation sites discussed in this section include campgrounds, picnic grounds, scenic overlooks, trailheads and interpretive service centers. The Forest's 33 developed campgrounds and 7 picnic grounds provide a capacity for 2976 persons at one time (PAOT). In addition, the State Park System provides 94 camp and picnic units with a capacity of 470 people at the Buffalo Bill Reservoir and 167 sites with a capacity of over 835 people at Boysen State Park. The BLM provides five camp or picnic areas with 120 sites and a capacity of 600 people near the south end of the Forest. Figure III-5 illustrates these non-Forest recreation facilities, statewide. Table III-7 summarizes all developed recreation facilities on the Forest, by District.

There are 17 developed recreation sites within the Forest boundary owned or administered by private individuals. The sites include guest ranches and lodges, and have an estimated capacity for 889 PAOTs. In addition to these sites, there are 3 winter sport sites with a total capacity of 480 PAOTs.

Although recreation is one of the major resource emphases on the Shoshone National Forest, in FY 1982 recreation funds comprised only 12.7 percent of the total Forest budget. This included developed and dispersed recreation and wilderness. Management of recreation has remained nearly the same for the past two decades. During this period, a few trailheads have been developed with funds provided by Park County. Management intensities for dispersed, developed, and wilderness are at a low level, and in many cases below the level described in the Regional Acceptable Work Standards (FSM 1310 R-2 ID No. 1, July 22, 1982).

Current facility conditions of developed recreation sites are below standards for reasons discussed above. Many of these sites would be in worse condition if not for the maintenance assistance from the Youth Conservation Corps (YCC) program between 1976 and 1980. Water systems at the developed sites are of a

FIGURE III-5 Non-Forest Recreation Areas and Sites State of Wyoming

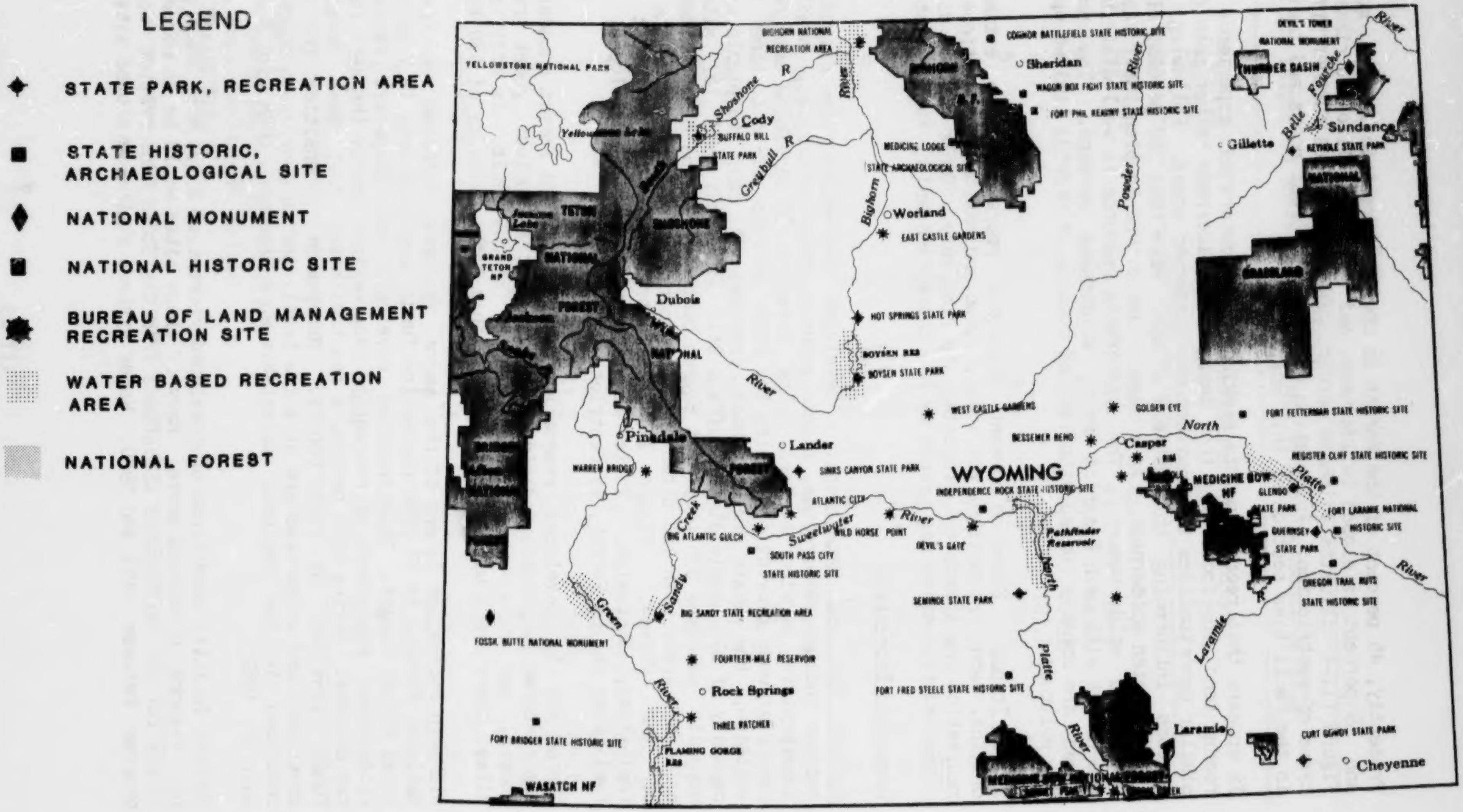

LEGEND
✦ STATE PARK, RECREATION AREA
■ STATE HISTORIC, ARCHAEOLOGICAL SITE
◆ NATIONAL MONUMENT
■ NATIONAL HISTORIC SITE
✸ BUREAU OF LAND MANAGEMENT RECREATION SITE
▨ WATER BASED RECREATION AREA
▨ NATIONAL FOREST
YELLOWSTONE NATIONAL PARK
Yellowstone Lake
Jackson Lake
GRAND TETON NP
TETON
NATIONAL
FOREST
SHOSHONE
NATIONAL
BIGHORN NATIONAL RECREATION AREA
Shoshone R
Cody
BUFFALO BILL STATE PARK
Greybull R
River
MEDICINE LODGE STATE ARCHAEOLOGICAL SITE
Bighorn
Worland
EAST CASTLE GARDENS
HOT SPRINGS STATE PARK
BOYSEN RES
BOYSEN STATE PARK
Dubois
River
Pinedale
Lander
WARREN BRIDGE
SINKS CANYON STATE PARK
FOREST
CONNOR BATTLEFIELD STATE HISTORIC SITE
Sheridan
WAGON BOX FIGHT STATE HISTORIC SITE
FORT PHIL KEARNY STATE HISTORIC SITE
River
Powder
DEVIL'S TOWER NATIONAL MONUMENT
THUNDER BASIN
River
Belle Fourche
Sundance
Gillette
KEYHOLE STATE PARK
NATIONAL
GRASSLAND
WEST CASTLE GARDENS
GOLDEN EYE
FORT FETTERMAN STATE HISTORIC SITE
North
BESSEMER BEND
Casper
RIM
REGISTER CLIFF STATE HISTORIC SITE
WYOMING
INDEPENDENCE ROCK STATE HISTORIC SITE
MEDICINE BOW NF
Platte
GLENDO STATE PARK
FORT LARAMIE NATIONAL HISTORIC SITE
GUERNSEY STATE PARK
ATLANTIC CITY
Sweetwater River
WILD HORSE POINT
DEVIL'S GATE
Pathfinder Reservoir
BIG ATLANTIC GULCH
SOUTH PASS CITY STATE HISTORIC SITE
Creek
River
OREGON TRAIL RUTS STATE HISTORIC SITE
Green
Sandy
BIG SANDY STATE RECREATION AREA
SEMINOE STATE PARK
North
Platte
Laramie
FOSSIL BUTTE NATIONAL MONUMENT
FOURTEEN-MILE RESERVOIR
Rock Springs
FORT FRED STEELE STATE HISTORIC SITE
River
THREE PATCHES
FORT BRIDGER STATE HISTORIC SITE
FLAMING GORGE RES
WASATCH NF
River
Laramie
CURT GOWDY STATE PARK
Cheyenne

TABLE III-7

Developed Recreation Facilities on the Shoshone National Forest by Ranger District

Facilities	Ranger District Clarks Fork	Greybull	Lander	Wapiti	Wind River	Total
Observation Sites						
Number of Sites	5	0	0	1	0	6
Capacity (PAOT)	210	0	0	100	0	310
Boating Sites						
Number of Sites	2	0	2	0	0	4
Capacity (PAOT)	75	0	50	0	0	125
Trailhead						
Number of Sites	4	2	8	6	0	20
Capacity (PAOT)	105	43	530	150	0	828
Campgrounds						
Number of Sites	8	2	5	13	5	33
Capacity (PAOT)	571	55	255	1285	560	2726
Picnic Areas						
Number of Sites	1	0	3	2	1	7
Capacity (PAOT)	25	0	140	70	15	250
Resorts						
Number of Sites	2	0	1	12	2	17
Capacity (PAOT)	55	0	20	714	100	889
Oganization Sites						
Number of Sites	0	0	2	1	0	3
Capacity (PAOT)	0	0	200	200	0	400
Summer Homes						
Number of Homes	1	3	9	67	20	100
Capacity (PAOT)	6	12	37	400	132	587
Winter Sport Sites						
Number of Sites	1	0	1	1	0	3
Capacity (PAOT)	80	0	200	200	0	480
Documentary Sites						
Number of Sites	0	0	0	1	1	2
Capacity (PAOT)	0	0	0	5	10	15
Information Sites						
Number of Sites	2	1	4	5	2	14
Capacity (PAOT)	53	10	36	201	56	356
Total Number of Sites	26	8	35	109	31	209
Total Capacity (PAOT)	1180	120	1468	3325	873	6966

major concern because of dilapidated conditions and the difficulty in meeting state and EPA potable water standards. Management of developed sites does not meet full-service level standards as defined in FSM 2300.

Recreation in Park County is influenced by Yellowstone National Park. For the most part, developed recreation sites serve as an overflow to the Park. During weekends and holidays, from June 1 to September 1, most developed sites are filled to capacity. An exception is the Wapiti Ranger District's North Fork Corridor. Because the corridor serves the east gate of Yellowstone National Park, use of developed sites is related to use patterns of the Park. During weekends, most visitors are in transit and are at their destination during weekdays. Therefore, in the North Fork, developed sites are filled to capacity during weekdays. Local residents use the facilities during weekends nearly year round. About 30 to 35 percent of the total use in the North Fork is by local residents.

Demand Trends. Use trends for developed recreation by Ranger District are shown in Table III-8. Details of projected demand by RIM activity types and ROS class through the year 2030 are available for review in planning records located at the Shoshone National Forest Supervisor's Office.

TABLE III-8

Projected Use Trends for Developed Recreation (MRVDs) by Ranger District

Planning Period	Ranger District Clarks Fork	Greybull	Lander	Wapiti	Wind River
Current	69.5	15.1	46.8	296.2	60.7
1	69.5	20.0	46.9	297.3	60.8
2	70.1	26.4	47.4	300.3	72.4
3	70.9	34.8	47.9	303.3	86.1
4	71.6	50.0	48.4	306.3	102.5
5	72.3	60.7	48.8	309.4	121.9

Visual Resources

The visual resource is a composite of terrain, geologic features, water features, vegetation and land use patterns that typify an area and influence the visual appeal a landscape may have for visitors.

The Shoshone National Forest encompasses the rugged Absaroka and Wind River Mountains. Below elevations of 10,000 feet, within the Absaroka Mountains, the landscape is characterized by forested drainages and extremely steep mountainsides with high cliffs and cascading talus slopes interlaced with contrasting rounded ridges and smooth sideslopes. Vegetation includes pine, spruce, fir and aspen with riparian vegetation along stream drainages. Open grass-covered slopes and barren cliffs are common throughout the area.

Waterfalls, cascading rapids, placid pools, and reflecting ponds are common in stream courses. In the Wind River Mountains, below elevations of 10,000 feet, terrain is basically a mix of steep slopes and wide, rolling ridges. Canyons are often deeply dissected and irregularly shaped. Rocky peaks and glacial remnants are common. Vegetation patterns consist of large stands of dark green conifers, primarily lodgepole pine, constrasting with open meadows and park lands. Wet meadows, ponds and small lakes occur throughout the landscape.

Above 10,000 feet the landscape is highlighted by rugged rocky peaks, cirque basins, canyons formed by glaciers, cliff talus slopes, and boulder fields. The peaks present a rugged sawtooth silhouette which contrasts sharply with the many rounded ridges and rolling plateaus which lace the area. In the upper elevations, vegetation is predominately low tundra types on the gentle sites; much of the surface is bare rock. Waterforms are characterized by glaciers, snow fields, springs and small transitory lakes. Active glaciers, two of which are the largest in the continental United States, are found near the Continental Divide.

Current Use and Management. The Shoshone National Forest is rich in natural scenic attractions and pleasing landscapes. Historically, Forest managers have recognized these values. More recently, the Forest has been using the Forest Service Visual Resource Management (VRM) System for project planning and in the development of the Visual Resource Inventory for the Forest. The VRM was developed and adapted Service-wide to enable Forest managers to integrate the principals of landscape management into multiple use resource planning and management. The VRM sets forth procedures which enable managers to identify and classify the visual characteristics of the principal landscape types which make up the Forest and to analyze, in advance, the visual effects of resource management actions.

The Forest is made up of six landscape character types as described by the Variety Class Criteria for the Central Rocky Mountain Area. (See Visual Resource Management in Glossary). Approximately 62 percent of the Forest's landscapes are classified as "Distinctive"; these are landscapes with unusual or outstanding visual quality. "Common" landscapes occur on about 29 percent of the Forest, while "Minimal" landscapes comprise about 9 percent of the Forest.

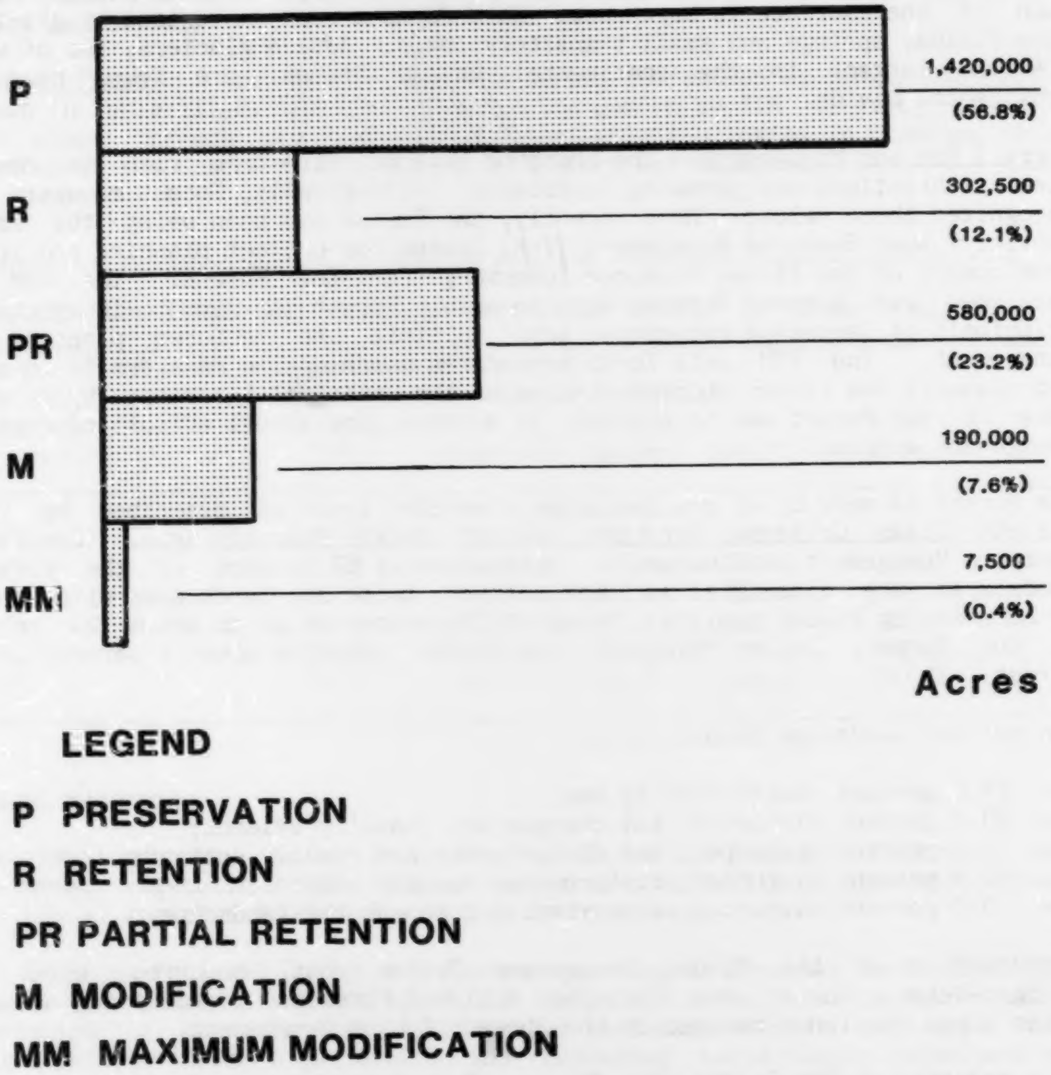
The current landscape condition is:

- 74.0 percent undisturbed by man;
- 20.0 percent disturbed, but changes not visually evident;
- 4.9 percent disturbed, but disturbances not readily noticed;
- 0.4 percent disturbed, disturbances readily noticed;
- 0.7 percent disturbed, disturbances dominate the landscape.

Coordination of the Visual Management System has occurred with the Bridger-Teton, Custer and Gallatin National Forests. Coordination has also taken place for lands managed by the Bureau of Land Management.

On a majority of the Forest, the forces of nature have prevailed and only ecological changes have occurred. Some Forest landscapes have changed because of timber harvesting, range improvements, wildlife habitat improvements,

FIGURE III-6 Inventoried Visual Quality Objectives



recreation developments, road and trail construction, and mineral activities. Such visual impacts occur most frequently on elevations below 10,000 feet. These landscapes are best suited for transportation and utility corridors, timber sales, mining, gravel pits, range and wildlife improvements, recreation facilities, or other management features. These activities and facilities will most likely occur on the same landscapes in the future.

The Visual Management System has been implemented on the Forest in Forest planning and site-specific projects. Landscape maintenance or enhancement projects have been implemented along some major travel corridors through vegetation management projects. Currently, the amount of landscape management varies by project, area and visual sensitivity.

Demand Trends. Demand projections for quality landscapes can be expressed in terms of public visual expectations (36 CFR 219.21 [f]) or the Inventoried Visual Quality. Figure III-6 is a summary of that demand.

Demands for quality landscapes also include a healthy appearing Forest. To control insect and disease problems associated with unmanaged forests, a demand for vegetation management exists. Vegetation management can provide a tool to control insect and disease, and therefore maintain a healthy appearing Forest.

Cultural Resources

The Shoshone National Forest occupies a part of western Wyoming that is rich in prehistoric and contemporary history. Using primary and secondary source material, there is verifiable evidence that prehistoric human occupation of the area dates from the Paleo-Indian Period more than 12,000 years ago to the Protohistoric period which saw the introduction of the horse and, later in time, European trade goods.

The first recorded exploration of the area by white men was in 1806 when pioneer trappers John Colter, Joseph Dickson and Forrest Hancock spent that winter near the Clark's Fork River. During the following half century, historic exploration of the area covered the period from 1806 to 1866 and was strongly influenced by the rise and fall of the international fur trade.

Settlement of the area by whites occurred during the period of 1867 to 1890 and was oriented around stock raising and related agriculture. The creation of Yellowstone National Park in 1872 and the establishment of the Yellowstone Timberland Reserve and the Teton Forest Reserve during 1891 to 1904 which led to the eventual establishment of the National Forests. This establishment has had a significant effect on the course of contemporary history of the area and its natural resource based economy. The Forest's historic cultural resources represent a variety of themes associated with mining, stock raising, logging, wildlife use and managment, and early recreation use.

Current Use and Management. The National Historic Preservation Act, as amended, directs that cultural resources on federal lands be inventoried and evaluated. Those which meet eligibility criteria must be nominated to the National Register of Historic Places (NRHP).

The Forest Service has completed a history of the Shoshone National Forest in 1980 and an overview of the prehistoric cultural resources of the Forest in 1982. The latter was updated in 1984.

By 1981, the Forest completed a cultural resource inventory on approximately 25,000 acres and 130 individual cultural resource sites were identified. The sites listed below have received national attention and have been placed on the National Register of Historic Places (NRHP).

- Wapiti Ranger Station
- Union Pass
- Dead Indian Campsite
- Pahaska Teepee
- Mummy Cave
- Brooks Lake Lodge

Additional sites have been recommended as eligible to the NRHP, but have not been formally nominated. The Resource Planning Act sets 1990 as the target date for the Forest Service to complete cultural resource inventories.

Protection efforts to date have been geared toward insuring that archaeological resources are not damaged through other resource activities. A majority of known sites are protected with anonymity and unscheduled surveillance. The Wapiti Ranger Station is being protected by occupancy, and some artifacts of the Dead Indian Site have been curated and are on display at the Supervisor's Office. Artifacts from Mummy Cave have also been curated and are on display at the Buffalo Bill Historical Center. The site itself is protected by closure and fencing. Union Pass has interpretation facilities for public enjoyment, and Brook's Lake Lodge is currently being renovated by the private sector .

Demand Trends. The Forest Service is required to complete cultural resource inventories by 1990. As ground disturbing activites occur in the future, additional site and area specific inventories will be undertaken. Present knowledge of the extent and significance of prehistoric sites on the Forest is poor. The overview report speculates that perhaps sixty times the known number of sites may exist. The report recommends the Forest Service take advantage of the unique opportunity to develop a predictive model system that will help create a more reliable and accurate cultural resource information base. It is highly important that ground disturbing activities include careful and timely cultural resource reviews prior to the actual activity. Subsequent site discoveries must be promptly and accurately recorded, reported, and evaluated; significant sites must be protected or curated.

WILDERNESS

The Shoshone National Forest has a vast, diverse, and highly scenic wilderness resource. Wilderness has been recognized as a vital part of the Forest's natural resource base since 1929 when the Beartooth, North and South Absaroka and the Glacier and Popo Agie Primitive Areas were administratively designated (Secretary of Agriculture Regulation L-20).

Current Use and Management. There are currently five wildernesses and one wilderness study area on the Forest. Passage of the Wyoming Wilderness Act of 1984 added 142,238 acres to existing wilderness for a total of 1,379,048 acres (56.7 percent of the Forest net acreage). An additional 14,700 acres was established by the Act as the High Lakes Wilderness Study Area. The Dunoir Special Management Area (28,987 acres) was not classified as wilderness, but the provisions of P.L. 92-476 still apply until resolution by Congress. This latter act provides for management of the Dunoir area to preserve its wilderness character. Table III-9 summarizes the designated Wilderness by Ranger District.

TABLE III-9

Wilderness by Ranger District

Ranger District	Wilderness	Net Acres
Clark's Fork	North Absaroka	181,393
	Absaroka-Beartooth	23,750
Greybull	Washakie	142,550
Lander	Fitzpatrick	73,737
	Popo Agie	101,991
Wapiti	North Absaroka	169,095
	Washakie	402,542
Wind River	Washakie	158,889
	Fitzpatrick	125,101
Forest Total		1,379,048

Planning for wilderness recreation opportunities incorporates the use of the recreation opportunity spectrum as described in the ROS Users Guide (USFS, 1981). The existing recreation opportunity spectrum composition for wilderness of the Shoshone National Forest is 8 percent Pristine, 74 percent Primitive, and 18 percent Semiprimitive.

Recreation use of wilderness on the Forest is well below the national average. Wilderness recreation use is about 14 percent of the Forest's annual total use. Users travel on horseback or on foot, skis or snowshoes, and engage in recreation activities such as backpacking, hiking, fishing, hunting, mountain climbing, photography, nature study and other activities dependent on settings provided by wilderness. Different types of use are found on the north half of the Forest, in comparison to the south half. Use on the Washakie and North Absaroka Wildernesses traditionally involves a high amount of horse and outfitter use. On the south half (Fitzpatrick and Popo Agie Wildernesses), use involves mostly backpacking and hiking use.

Figure III-7 displays the current percent wilderness and primitive areas by ROS class as well as use by ROS class.

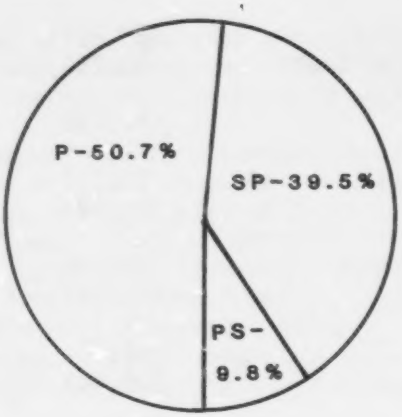
FIGURE III-7

Current Wilderness Recreation Opportunities

PS - Primitive
P - Primitive
SP - Semiprimitive

PERCENT WILDERNESS BY ROS CLASS (acres)

(Total Wilderness Acres - 1,379,048)



PERCENT WILDERNESS USE BY ROS CLASS (RVD's)

(Total average annual Wilderness and Primitive Area Use, 1972-1981, 147.2 MRVDs)

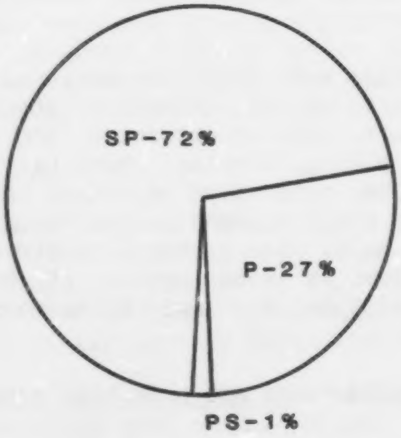


TABLE III-10

Projected Trend for Wilderness Use in Average Annual Thousands of RVDs

Ranger District	Planning Period	Pristine	Primitive	Semi-Primitive
Clarks Fork	Current	.2	8.2	28.6
	1	.2	10.7	29.5
	2	.3	15.7	41.6
	3	.4	23.1	58.6
	4	.6	34.0	82.7
	5	1.0	49.9	116.6
Greybull	Current	0	5.1	15.9
	1	0	7.2	22.6
	2	0	10.1	39.5
	3	0	14.3	69.2
	4	0	20.2	121.1
	5	0	28.5	211.9
Lander	Current	3.6	11.2	42.7
	1	3.8	12.0	45.0
	2	4.2	13.9	50.4
	3	4.6	16.1	56.4
	4	5.2	18.7	63.2
	5	5.8	21.7	70.8
Wapiti	Current	.2	5.0	35.2
	1	.2	5.8	36.5
	2	.2	7.8	39.4
	3	.3	10.6	42.6
	4	.3	14.3	45.9
	5	.4	19.3	49.7
Wind River	Current	.25	10.8	39.0
	1	.3	12.9	47.6
	2	.4	17.5	68.0
	3	.6	23.8	97.3
	4	.8	32.4	138.2
	5	1.1	44.1	199.0

Total average annual use between 1972 and 1981 in the areas now designated as wilderness was 147.2 MRVDs.

Current management philosophy on the Forest is to provide the wilderness user a management setting that minimizes the amount of restrictions and controls. Restrictions are limited to standard wilderness regulations. Field personnel and financing have not been available to manage the wilderness properly. As a result, management jobs such as contacting visitors, checking livestock grazing, maintaining trails, implementing wilderness plans and other tasks associated with wilderness administration have not been performed to the required standard.

Demand Trends. Wilderness use trend projections for the Shoshone National Forest are detailed by ROS in Table III-10. Other details of projected demand by RIM activity types and by ROS class through the year 2030 are available for review in planning records located at the Shoshone National Forest Headquarters.

FISH AND WILDLIFE

Wildlife

Current Use and Management. The Forest provides a wide variety of suitable habitats for many species of mammals, birds, reptiles, amphibians, and fish, and is perhaps unequaled in the contiguous 48 States in terms of big game populations and diversity. General groupings of the 337 vertebrate species that occur on the Forest and their game status are shown in Table III-11.

The quality and kinds of wildlife habitat is directly related to the abundance, arrangement, type and successional stages of vegetation (vegetation diversity). Vegetation diversity is fairly well represented on the Forest outside of wilderness, with a few notable exceptions. The Dunoir area contains primarily climax stage vegetation with little or no mid-successional or early-successional vegetation stages. Large areas of climax vegetation within the Dunoir need modification to improve forage-cover ratios for elk and deer. Big game summer ranges primarily within wilderness generally lack mid-successional and early-successional vegetation states. The aspen habitat component is decreasing on the Forest due to conifer encroachment, mature and decadent stands lacking regeneration, and past fire control efforts. Winter range for elk is decreasing primarily off-Forest due to increasing development of private lands. Migration paths traditionally used by a portion of the Whiskey Mountain bighorn sheep herd are being closed by encroachment of conifers into previously open routes. This imminent closure would result in isolation of some sheep to their winter range.

Over the past decade, the Forest Service has expanded from a habitat management policy of protecting habitats through coordination with other Forest resource management activities and mitigation measures, to one which also includes increased direct investment in habitat improvement projects. Prime examples of this shift are: cooperative habitat improvements for bighorn sheep on Whiskey Mountain (such as water development, seeding, fertilization, snow fencing and vegetation management by prescribed burning); aspen cutting to maintain this habitat component for wildlife; sagebrush treatment to increase forage for elk, bighorn sheep and deer; willow treatment and protection for moose and riparian

TABLE III-11

Number of Vertebrate Species on the Shoshone National Forest

Vertebrate Species Group	Total Number of Species	Number of Game Species1/
Mammals	72	13
Birds	230	35
Reptiles	9	-
Amphibians	7	-
Fish	19	12
Total	337	60

1/ Species that may be harvested by hunting, fishing or trapping with a license or permit issued by the State of Wyoming or a Federal license in the case of migratory waterfowl.

TABLE III-12

Estimated Populations of Big Game Species on the Shoshone National Forest

Species	Population, 1983
Elk	15,700
Mule Deer	13,200
White-Tailed Deer	250
Bighorn Sheep	3,890
Moose	855
Antelope	1,210
Black Bear	680
Mountain Goat	100
Mountain Lion	41

dependent species; and fencing of ponds to enhance waterfowl production. Estimated populations of the main species of big game animals are shown in Table III-12.

The most important big game species from a socio-economic standpoint are elk, deer and bighorn sheep. In 1981, these three species provided 48.9, 7.6 and 2.7 thousand recreation visitor days (MRVD's) of big game hunting respectively. In addition, bighorn sheep viewing (nonconsumptive use) on Whiskey Mountain included 60 MRVD's.

The Comprehensive Wildlife Management Plan for National Forest System Lands in Wyoming (State of Wyoming) contains 1984 population objectives of big game species on the Forest. Table III-13 compares existing populations to these objectives.

Demand trends. Projected wildlife-related recreation use trends are shown in Table III-14. Some assumptions regarding future wildlife management on the Forest are:

- The demand for both consumptive and nonconsumptive wildlife use will increase significantly in the next decade.
- There will be increased pressure on the Forest Service to improve the quality of big game winter range on the Forest as more adjacent winter range is lost to development.
- The demand for cooperation with the Wyoming Game and Fish Department to provide adequate wildlife habitat and obtain joint population and habitat inventories will increase.

TABLE III-13

Populations of Big Game Species Compared to State Objectives

Species	1983 Population1/	1984 Objective2/	Percent of Objective
Elk	15,700	15,075	104
Mule & White tail deer	13,450	26,000	52
Bighorn Sheep	3,890	3,300	118
Moose	855	1,085	79
Antelope	1,210	2,250	54
Black Bear	680	500	136
Mountain Goat	100	200	50
Mountain Lion	41	95	43

1/ Shoshone National Forest Annual Wildlife Report
2/ Comprehensive Wildlife Management Plan for National Forest System Lands in Wyoming, 1980

TABLE III-14

Use Trends for Wildlife-Related Recreation in Average Annual Units

Ranger District	Planning Period	Consumptive Wildlife User Day	Nonconsumptive Wildlife User Day
Clark's Fork	Current	9,000	9,000
	1	9,700	9,700
	2	10,379	10,379
	3	11,105	11,105
	4	11,883	11,883
	5	12,715	12,715
Greybull	Current	14,000	14,000
	1	15,000	15,000
	2	16,050	16,050
	3	17,174	17,174
	4	18,376	18,376
	5	19,662	19,662
Lander	Current	6,200	6,200
	1	6,700	6,700
	2	7,169	7,169
	3	7,671	7,671
	4	8,207	8,207
	5	8,782	8,782
Wapiti	Current	24,200	24,200
	1	25,900	25,900
	2	27,713	27,713
	3	29,652	29,652
	4	31,728	31,728
	5	33,949	33,949
Wind River	Current	30,300	30,300
	1	32,400	32,400
	2	34,668	34,668
	3	37,094	37,094
	4	36,691	36,691
	5	42,469	42,469

Management Indicator Species

Management Indicator Species (MIS) are those which indicate habitat suitability for other species with similar habitat needs. They are used to guide and monitor wildlife diversity. A set of management indicator species was selected to reflect management needs for the species inhabiting the Forest. Selection of these species was based on the following additional criteria:

- Public issues or management concerns related to certain species or groups of species.

- Endangered or threatened species listed nationally or by the State of Wyoming.

- Economically important species that are hunted, fished or trapped.

- Species that have limited or special habitat requirements that may be significantly influenced by management practices resulting from land use allocation.

- Species that represent the habitat requirements for a larger group of species.

Methods used to select indicator species are explained in detail in the Planning Records.

The selected species were grouped into three categories: 1) Featured Species; 2) Recovery Species; and 3) Ecological Indicator Species. Following are the management indicator species selected for each category.

Featured Species. Those species that are hunted, fished, or trapped are defined as featured species. On the Forest, those species are:

- Elk and Mule Deer - Economically important and public issue.
- Bighorn Sheep - Economically important and public issue.
- Moose - Limited habitat that will readily monitor change and economically important.
- Mountain Goat - Unique and limited habitat.

Recovery Species. Recovery species are those which carry a state or federal designation as threatened or endangered. On the Forest, these are:

- Bald Eagle - Endangered and environmentally sensitive.
- Peregrine Falcon - Endangered and environmentally sensitive.
- Black-footed Ferret - Endangered and environmentally sensitive.
- Gray Wolf - Endangered.
- Grizzly Bear - Threatened and environmentally sensitive.

Ecological Indicator Species. Those species that are dependent on specific habitat characteristics during some phase of their lifespan, or are particularly sensitive to management activities, are ecological indicators. On the Forest, these species are listed below.

- Pine Marten - Restrictive habitat requirements in late successional conifer stages.

TABLE III-15

Use Trends for Fish-Related Recreation in Average Annual Units

Ranger District	Planning Period	Fish User Day
Clark's Fork	Current	15,000
	1	16,100
	2	17,227
	3	18,433
	4	19,723
	5	21,103
Greybull	Current	3,500
	1	3,800
	2	4,066
	3	4,350
	4	4,655
	5	4,981
Lander	Current	28,400
	1	30,400
	2	32,528
	3	34,800
	4	37,241
	5	39,848
Wapiti	Current	30,200
	1	32,300
	2	34,561
	3	36,980
	4	39,568
	5	42,338
Wind River	Current	14,300
	1	15,300
	2	16,371
	3	17,516
	4	18,743
	5	19,956

- Goshawk - Sensitive to disturbance in nesting areas and representative of late successional conifer stages of large acreages.
- Brewers Sparrow - Representative of sagebrush communities.
- Hairy Woodpecker - Representative of late successional aspen communities, and snag dependent species.
- Beaver - Representative of special and limited riparian habitat that may be influenced by management practices.
- Blue grouse - Limited habitat and population numbers that may be affected by vegetation treatment.
- Ruffed grouse - Representative of multi-storied aspen communities.

Fish

Current Use and Management. There are approximately 1,000 miles of perennial streams and 7,900 acres of lakes and reservoirs on the Forest which provide good fish habitat. There are approximately 500 lakes on the Forest with the majority of these being on the Beartooth Plateau, and in the Fitzpatrick and Popo Agie Wildernesses. Many of these lakes are barren and have not been stocked. Important fish species include Yellowstone and Snake River cutthroat, rainbow, German brown and golden trout, mackinaw and Arctic Grayling.

Game trout were selected as the indicator species for aquatic habitat. Most lakes and streams support a mix of two or more of these types of trout. All game trout are economically important. Habitat requirements are similar for trout where they are found on the Forest, and each type would be an indicator wherever it is found.

In fiscal year 1981, approximately 83,200 fishing RVD's were provided by fisheries located within the Forest.

The Comprehensive State-wide Wildlife Management Plan for National Forest System Lands in Wyoming sets priorities for fish habitat work. Management of these habitats is an on-going effort in cooperation with the Wyoming Game and Fish Department.

Management programs emphasize improving riparian habitat, bringing stream fisheries up to potential productivity, identifying stream and lake sites where fish habitat can be improved, and incorporating fish habitat management objectives into other Forest resource activities such as grazing, timber harvest, mining, and oil and gas activities.

Demand Trends. Demand for fishing is expected to increase. Projected fish-related recreation trends are presented in Table III-15. In order to meet this demand, the Forest will need to provide fish habitat in highly productive reservoirs, lakes and streams. The Forest will continue to cooperate with the Wyoming Game and Fish Department to provide adequate fish habitat in response to the need for a healthy environment for fish. It is anticipated that some of the presently barren lakes will be stocked with fish to meet increased demand.

Threatened and Endangered Species

Current Use and Management. The Endangered Species Act of 1973 requires that all federal agencies conserve threatened and endangered species and their habitats, to aid in population recovery. Management of the Shoshone National Forest could influence the threatened or endangered species listed below.

Common Name	Scientific Name	Designation 1/
Bald Eagle	Haliaeetus leucocphalus	Endangered
American Peregrine Falcon	Falco peregrinus anatum	Endangered
Gray Wolf	Canis lupus irremotus	Endangered
Black-footed Ferret	Mustela nigripes	Endangered
Grizzly Bear	Ursus arctos horribilis	Threatened

1/ Endangered Species Act of 1973, as amended.

Bald eagles have been observed on the Forest primarily during the winter months. Although no nesting and wintering areas have been reported or observed, potential nesting areas have been delineated. A mature pair of bald eagles has been observed for several years during the mid-to-late summer months immediately adjacent to the Forest in the Dunoir drainage.

Black-footed ferrets have not been found on the Forest, but occur three to five airline miles outside of the Forest boundary near Meeteetse, Wyoming. The Forest Service provides one member to the Wyoming Black-footed Ferret Advisory Team (BFAT). Members of this team are composed of Federal and State agency personnel and individuals who function as advisors in planning projects to study the ferrets.

The American peregrine falcon has been reported on a few occasions, but nesting is not known to occur on the Forest. The Wyoming Game and Fish Department has identified areas along the southern boundary of the Washakie Wilderness and the Clarks Fork canyon as potential reintroduction sites for the peregrine.

The Northern Rocky Mountain (gray) wolf's presence on the Forest has not been confirmed in recent years, although there have been several sightings (principally in the Greybull River drainage) of large canids (dog-like animals) in the last decade. The Northern Rocky Mountain Wolf Recovery Plan lists portions of the Forest as potential wolf habitat for possible reintroductions in the future.

The grizzly bear was identified as a "threatened" species in 1975 under the provisions of the Endangered Species Act of 1973. Management of grizzly bears on the Forest is directed by "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area" (referred to as Guidelines). These Guidelines were adopted by the National Park Service, Forest Service, Fish and Wildlife Service and the states of Wyoming, Montana and Idaho in 1980. In the Guidelines, habitat is divided into five management situations. Three of these occur on the Forest and are briefly described below:

Management Situation 1 -	Contains grizzly bear population centers and habitat components needed for survival and recovery of the species.
Management Situation 2 -	Lacks distinct grizzly bear population centers. The area may contain some bears and suitable habitat, but is not considered necessary for the survival and recovery of the species.

Management Situation 3 -	Grizzly bear presence is possible but infrequent. Human occupancy and use results in conditions which make grizzly presence untenable.

Table III-16 displays the current occupied habitat acres for the Forest.

TABLE III-16

Current Occupied Grizzly Bear Habitat Acres on the Shoshone National Forest

Management Situation 1	Management Situation 2	Management Situation 3	Total
412,000 acres	819,600 acres	17,400 acres	1,249,000 acres

In 1982, a recovery plan for the grizzly was completed and subsequently approved by the US Fish and Wildlife Service. This Plan identifies recovered population goal actions this agency believes will be necessary for conservation and ultimate recovery (delisting) of the species. The population goal identified for the Yellowstone ecosystem is approximately 300 bears. Actions belived necessary to reach this goal include reducing the following:

1) direct man caused mortality (illegal hunting, mistaken identity,trapping and handling deaths),

2) adverse habitat changes,

3) human displacement of bears, and

4) grizzly-human conflict situations.

Table III-17 displays the causes of grizzly bear mortality for the last five years. The Shoshone Forest must play a key role in these actions if recovery of the greater Yellowstone population is to occur.

The status of the grizzly bear is receiving widespread National attention. The Yellowstone area represents one of the two realistic opportunities for establishing or maintaining a viable grizzly bear population. While there are few persons who actually express the view that extinction of the grizzly bear should be encouraged, most object to restrictions on or prohibitions of activities which they are accustomed to. It is anticipated that increased restrictions on activities such as recreation use, timber harvesting and livestock grazing (provided for in implementation of the Guidelines and Grizzly Bear Recovery Plan) will create increased polarizations on the grizzly bear issue.

Demand Trends. There is an apparent demand for increasing populations above the level needed for recovery to allow trophy hunting. Management of the grizzly bear and its habitat, and reducing grizzly-human conflicts, is a major thrust of the Forest's programs in the next decade, or until a recovered population is established.

TABLE III-17

Grizzly Bear Mortality Expressed in Number of Bears*

Causes of Mortality	1980	1981	1982	1983	1984
Natural Mortality	-	-	1	-	1
Hunter Related	1	1	4	-	1
Control and Export	-	-	-	-	-
Self Defense	-	-	-	-	-
Handling Accident	-	-	1	-	-
Forest Total	1	1	6	0	2

*The Forest goal for preventable mortalities is zero.

RANGE

Approximately 12 percent, or 290,000 acres, of the Shoshone National Forest is classified as capable and suitable livestock rangelands. The suitable range is generally in fair or better ecological condition, with isolated cases of deteriorated range due to excessive grazing by livestock, wildlife, or both.

Current Use and Management. Grazing was one of the first uses made of the Forest by early settlers. Large numbers of cattle, horses and sheep were grazed in open grazing systems throughout the area. Grazing restrictions have increased from the time the Forest was set aside in 1891. There are still a few areas on the Forest that have not fully recovered from past heavy grazing. Some alpine ranges still bear the marks of trailing damage that occured 40 to 80 years ago. Trends in total permitted livestock have been downward as reductions were made to protect the forage and soil resources and through voluntary relinquishments of some permits. Some grazing allotments have had reductions in permitted numbers to provide additional forage for increasing numbers of elk and bighorn sheep. There are currently 68 cattle and horse allotments and 21 sheep allotments on the Forest. In addition, there are large areas, primarily in wilderness, that are classified as recreation horse allotments. There are presently 219 horses, 17,297 cattle and 24,804 sheep permitted to graze under term permit. Cattle and horse use has varied from 68,000 Animal Unit Months (AUMs) in 1940 to the current level of approximately 74,700 permitted AUMs. Sheep grazing has dropped from a level of 46,000 AUMs in 1935 to approximately 12,000 permitted AUMs at the present time.

The average length of time that sheep are grazed on the Forest is one and one-half months. Cattle are grazed on the Forest an average of four months. The periods of time allowed for cattle and sheep grazing are due to the relatively short grazing seasons in their respective ranges. This compares to an average growing season of six to seven months on low elevation range lands adjacent to the Forest.

Some ranchers with Forest grazing permits are economically dependent on these permits for the continuation of their operations. Ranching operations in general are moving from small family operations to large company operations. Sheep grazing on the Forest is decreasing with many of the allotments in nonuse or vacancy status. There is an increase in requests to convert sheep allotments to cattle allotments.

Most grazing occurs under deferred rotations or extensive (open season-long) management systems. The topography of the Forest is such that intensive grazing systems (rest-rotation) cannot be implemented. Most of the allotments range greatly in elevation, with the uppermost areas not ready for grazing until early fall. Therefore, grazing that high pasture first on a rotation system is impractical. Deferred rotation and modified rest-rotation systems have been implemented on some allotments.

Larkspur, Canada thistle and shrubby cinquefoil are problems in some areas. Canada thistle occurs in small isolated areas (primarily along roadways) while larkspur is generally found throughout the Forest and is the principal cause of livestock poisoning on some allotments.

Demand Trends. The demand for cattle grazing is expected to continue to exceed the Forest's production capability up to 140,000 AUMS. The demand for sheep grazing permits is expected to continue to decline with many sheep permits being converted to cattle permits. Grazing permits will be consolidated as smaller ranches sell their base property. The demand for forage by recreation livestock will continue to increase, and a continued investment will occur in those areas that yield the greatest benefit for the cost incurred in terms of both domestic livestock and wildlife benefits.

TIMBER

Only about six percent of the entire Forest is available for timber production. In this analysis, 144,682 acres, or 5.9 percent of the landbase, is tentatively suitable for timber production. This means that only about 0.4 percent of the Forest will be affected by timber management activities in any ten year time span.

Timber management provides a source of materials for the forest products industries, posts and poles for fence construction, and an abundant source of firewood for local residents. Beyond these direct benefits, forest cover can be manipulated on lands suitable for timber production as part of a healthy ecosystem to produce multiple-use benefits. Though the forestwide effects of timber management are small, some areas with concentrations of tentatively suitable timber can be dramatically affected. In such areas, timber management is important because it contributes to production of the following set of multiple-use benefits:

- Much of the timber on the Forest is older, mature to overmature. This makes trees on the forest highly susceptible to insect and disease attacks, particularly in the harsher climates on the Wind River and Lander Districts. Direct control of epidemics is an expensive, short term solution. Replacing older trees with younger trees, through harvesting timber on those areas that are suitable, provides a means to fight existing problems while creating diversity in large blocks of trees of the same species and age class. Instead of a mono-culture of trees, all susceptible at the same time, the Forest in the long term becomes a mosaic of species and age classes where only a small portion is susceptible in any decade. In this way, timber management not only provides direct benefits in terms of revenues, but provides a means to improve the health of stands and avoid future insect and disease epidemics.

- An additional benefit of changing current age class distribution is the opportunity to increase early age classes and create openings in otherwise solid blocks of timber. This can significantly improve habitat needed by many wildife species, including deer and elk. On this Forest, tentatively suitable timberland tends to occur in large blocks. Many of these blocks are along wildife migration routes between summer and winter range. Creating openings and browse in areas surrounded by cover not only aids wildlife habitat, but takes some wildlife pressure off rangeland grazed by domestic livestock.

- The aesthetic beauty of this Forest is important to thousands of visitors every year, particularly because of its proximity to Yellowstone National Park. Most people enjoy a pattern of vegetation that includes many different ages and sizes of trees. By coordinating visual management with timber management, silvicultural treatments can be used to create desired diversity and enhance forest beauty. Timber management can provide recreation and visual quality outputs along with wood products; all at a lower cost than if attempted separately.

- Dispersed motorized recreation is a very popular activity on the Forest, particularly on access routes to Yellowstone and Grand Teton National Parks. Dispersed non-motorized recreation is also very popular. As more people use existing roads and access areas, the quality of recreation experiences can decline. Providing roads through attractive and well managed areas by coordinating timber management and travel management programs offers the opportunity to enhance dispersed recreation.

- A related resource management need is improved access for public firewood gathering. Much of the firewood along existing roads has been removed through public firewood programs. Improved Forest access as a result of timber management will substantially increase the supply of accessible firewood.

- Another benefit of timber management is increased water production. It is well documented that vegetation manipulation can increase water yields, particularly in arid parts of the west. There is some potential for this on the Shoshone where small patch cuts will be made for enhancing water flow and yield. Integrating these cuts into a broader timber management program reduces the costs of creating desired openings.

Current Situation. Timber management on the Shoshone National Forest has been guided by a timber management plan prepared for the period of 1976 to 1986. Under this plan, average annual harvests were set at 10.45 MMBF. Over the period of 1976 to 1983, the Forest sold an average of 11.8 MMBF with an average of 8.57 MMBF actually cut each year. Some of these sales and cuts were not designed for wood-fiber production; rather the treatment was designed to help control insects or disease and to improve production of multiple-use benefits such as wildlife habitat or visual diversity.

As part of current planning efforts, there has been a reassessment of land suitable for timber production. This has resulted in adding some lands to the tentatively suitable base. These additions include lands that are part of roadless areas previously studied for wilderness, as well as lands on steeper slopes (40 to 60 percent). Table III-20 displays the differences between land use classification in the 1976 Timber Management Plan and that used in this draft EIS (see also Appendix C). Adding these lands increased the timber base for planning by about 52,000 acres from approximately 93,000 acres of standard, special and marginal lands to approximately 144,682 acres of tentatively suitable land. Table III-21 shows the distribution of tentatively suitable lands between age classes, species and productivity groups. Current timber harvest levels can probably be maintained; this will meet demands anticipated in the near future, and over the planning horizon.

Demand trends. Demand for sawtimber at local mills appears stable. Poor markets nationally have led to some short term drops in sales and cuts, however projections for the next ten years show a stable to slightly increasing trend. Table III-18 shows the sold and cut volumes for the last 10 years. There has been an increase in demand for posts, poles and firewood over the last five years. This trend is expected to continue in the foreseeable future. Projections of demand show a combined demand of up to 14.0 MMBF by the end of the next decade. Table III-19 displays projected demands for the next 50 years.

Reforestation. Shelterwood, seed tree selection and clear cutting regeneration methods are used on the Forest. These methods depend on natural regeneration from seed produced on site or nearby. When seed of the desired species or of suitable genetic quality is not available for the site, seedlings grown in a nursery from desired seed sources are hand planted. This may also be necessary when forested areas are destroyed by fire, insects or disease.

Tree Improvement. Increasing demands for multiple-use goods and services, including timber, as well as increasing management costs suggest a need to produce more high quality fiber per acre per year. One method of doing this is to use sound genetic principles in all vegetation management activities. This is being done on the Forest through careful selection of trees left in the overstory of shelterwood cuts, selection of trees to be cut in commercial thinning, and through application of selection harvests in all age stands. In each case, trees that appear to be superior are favored as seed source trees. Beyond this, a program for developing areas to produce genetically superior seeds is being initiated on the Forest.

TABLE III-18

Sold and Cut Timber Volumes in MBF

Year	Sold	Cut*
1974	3,334.76	6,121.36
1975	5,199.77	2,851.67
1976	24,527.12	4,336.90
1977	9,093.22	6,555.41
1978	8,407.97	6,215.22
1979	7,419.14	17,538.26
1980	8,237.28	8,524.63
1981	9,123.47	12,227.01
1982	11,349.86	6,039.90
1983	13,260.90	7,115.09

* Cut volumes include up to 30 percent salvage volumes.

TABLE III-19

Projected Sawtimber Demand in Thousand Board Feet (MBF)

Period	Projected Average Annual Demand (Sawtimber Only)
1980 - 1990	12,000
1990 - 2000	12,500
2005 - 2010	13,000
2010 - 2020	13,500
2020 - 2030	14,000

TABLE III-20

Land Use Classification for Timber Management (Acres)

	1976 Timber Management Plan	1985 Forest Plan
Water	8,100	11,746
Non-Forested Land	1,070,400	1,120,275
Forested Reserved	435,000	259,381
Forested Deferred	133,600	66,600
Unregulated Component	358,800	NA
Not Capable	NA	732,529
Insufficient Data	NA	97,912
Capable and Available but not Suitable	332,400	
Forested land used as base for timber harvest scheduling	93,600	144,682
NET NATIONAL FOREST	2,431,900	2,433,125
Standard Component	59,500	NA
Special Component	4,600	NA
Marginal Component	29,500	NA
Capable, Available and Tentatively Suitable	NA	144,682
FORESTED LAND USED AS BASE FOR TIMBER HARVEST SCHEDULING	93,600	144,682

TABLE III-21

Distribution of Tentatively Suitable Timber Land by Species, Age Class, Productivity, and Slope Steepness (Acres)

	COVER TYPE																
	Douglas Fir				Engelmann Spruce				Lodgepole Pine				Total for all Cover Types				
	Productivity Group1/				Productivity Group				Productivity Group				Productivity Group				
Age Class (Years)	L	M	H	S	L	M	H	S	L	M	H	S	L	M	H	S	Totals
0-20	-	366	257	-	40	2760	764	-	3487	21382	682	-	3527	24508	1703	-	29738
80-100	70	37	85	-	-	367	-	-	1170	2439	253	-	1240	2843	338	-	4421
100-120	-	909	477	-	-	881	95	-	4861	4657	517	-	4861	6447	1089	-	12397
150 +	5204	3070	937	4999	9919	2200	895	1363	25360	10600	813	923	40483	15870	2645	7285	66283
All Age	-	1648	2238	-	-	22868	5089	-	-	-	-	-	-	24516	7327	-	31843
Column Totals2/	5274	6030	3994	4999	9959	29076	6843	1363	34878	39078	2265	923	50111	74184	13102	7285	144682

1/ L = Low
M = Moderate
H = High
S = Low, 40-60 percent slope

2/ Totals by Cover Type: 20297 Douglas Fir, 47241 Engelmann Spruce, 77144 Lodgepole Pine

Timber Stand Improvement. Cultural treatment that improves the composition, condition or growth of a stand of trees is considered timber stand improvement. This most often refers to noncommercial operations such as precommercial thinning or removal of diseased trees in the overstory. Some of these operations can be integrated into a larger commercial sale, however. Currently, this Forest has a timber stand improvement program involving 100 to 200 acres per year. Most of this is in diseased stands of lodgepole pine on the Wind River District.

WATER

The Shoshone National Forest lies primarily within the upper Missouri River Basin, subdivided by the Wind, Big Horn, and Clark's Fork of the Yellowstone River basins. This three basin area shown in Figure III-8 is hereafter referred to as the Basin. The southern tip of the Forest is in the Sweetwater drainage which flows into the Platte River system. Principal rivers within the Forest boundary are the Clarks's Fork, North and South Fork of the Shoshone, Greybull, Wind and Popo Agie Rivers (See Figure III-8). Numerous smaller rivers and streams also carry water produced on the Forest to downstream users. The average annual water yield from the Forest is approximately 3.6 million acre-feet, an estimated three-fourths of the surface water supply in the Wind, Big Horn and Clark's Fork basins below the Wyoming-Montana border. There are presently no trans-basin diversions existing or proposed within the Forest boundary, but there are six principal (over 1000 acre feet capacity) reservoirs serving primarily agricultural needs off-Forest.

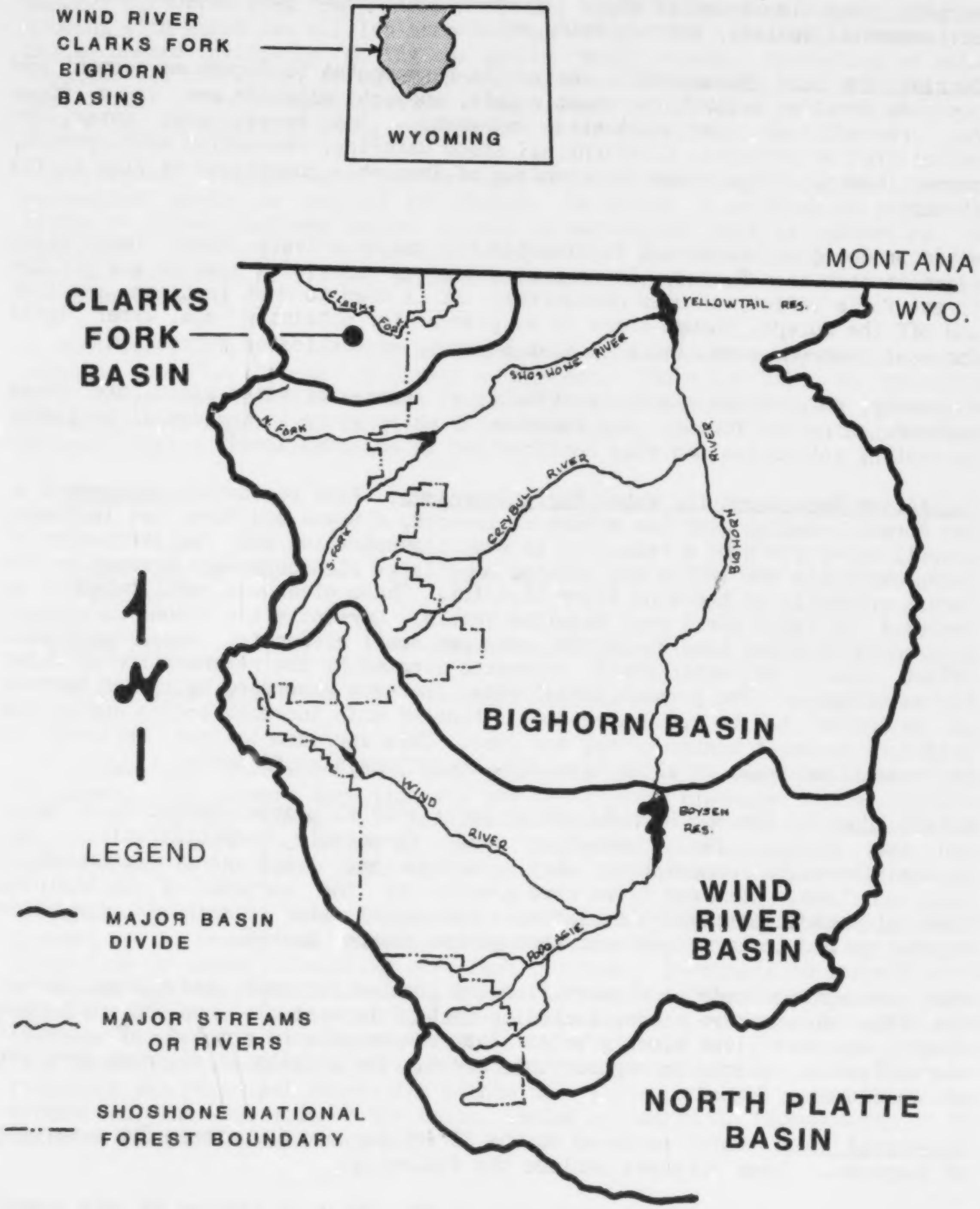
Most of the approximately 4,900 miles of perennial streams on the Forest are free-flowing. A major portion of the annual runoff is a result of snowmelt during the period of May through July, with a peak usually in mid-June. Late summer, fall and winter runoff is supported primarily by groundwater flows and shallow alluvial aquifers that are recharged each spring. Portions of the Forest, notably the Beartooth Plateau and the higher elevations of the Wind River Range, contain numerous lakes, ponds and wetland areas. Many active glaciers are found along the Continental Divide in the Wind River mountain range.

Groundwater is generally not available throughout the Forest. However, groundwater bearing structures are found on the north side of the Wind River District, along the South Fork of the Shoshone River, and in selected areas in the Clark's Fork District. Most water wells on the Forest tap relatively shallow alluvial deposits along major stream courses.

The recharge of groundwater supplies in the central Basin is dependent partly upon the water-bearing structures (such as the Madison and Tensleep formations) that extend into and surface on the Forest. Some recharge at depth may be occurring by percolation through volcanic materials, particularly where they are fractured.

The Forest water program, which includes water data collection, water uses administration, management service activities and watershed rehabilitation, is inadequately funded. The FY 1982 Forest budget allocated only one percent to the water program. In fiscal years 1983 and 1984, the water program received only one-third of one percent of the total annual budgets for those years. Program goals for water quality, as expressed in the Regional Acceptable Work

FIGURE III-8 River Basin Illustration


WIND RIVER
CLARKS FORK
BIGHORN
BASINS
WYOMING
MONTANA
WYO.
CLARKS FORK BASIN
CLARKS FORK
YELLOWTAIL RES.
SHOSHONE RIVER
N. FORK
GREYBULL RIVER
S. FORK
BIGHORN RIVER
BIGHORN BASIN
WIND RIVER
BOYSEN RES.
POPO AGIE
WIND RIVER BASIN
NORTH PLATTE BASIN
N
LEGEND
MAJOR BASIN DIVIDE
MAJOR STREAMS OR RIVERS
SHOSHONE NATIONAL FOREST BOUNDARY

Standards (FSM 1310), in the Forest Service Manual (FSM 2500), in RPA watershed targets, and in a cooperative agreement with the State Department of Environmental Quality, are not being met.

Current Use and Management. Water is fundamental to Forest management and use. It provides habitat for aquatic life, supports wildlife and is a focus for recreational and aesthetic enjoyment. The Forest uses water for administrative purposes, firefighting, stock watering, recreation developments, summer homes, lodges and maintenance of favorable conditions of flow in its streams.

Water produced on the Forest is diverted for use on private lands immediately adjacent to the Forest. It is also stored in reservoirs both on and off the Forest for a variety of uses downstream. It is used to meet instream needs on and off the Forest, though there is no process for obtaining legal water rights for most instream needs (such as fish habitat, aesthetics or recreation).

Currently, no programs aimed specifically at increasing water yield are being implemented on the Forest. Any increase in water yield is incidental to timber harvesting activities and road construction in forested areas.

Vegetation Management for Water Yield Increases. Past vegetation management on the Forest, coupled with the effect of insects, disease and fire, has increased overall water yield by a reduction in evapotranspiration and redistribution of snowpacks. In the 1950's and 1960's, many large clearcuts were created on the Forest primarily on the Wind River District. These clearcuts contributed to an increase of water yield over baseline levels. Currently the timber management program is oriented towards partial cuts and small clearcuts; these operations offset some of the water yield decreases created by the regeneration of older harvested areas. The present annual water increase generated by timber harvest is estimated to be 2,950 acre-feet. Most of this increase occurs during the principal snowmelt months of May and June. This increase is not believed to increase flood peaks or alter base flow conditions significantly.

Forest Uses. The Big Horn Adjudication of 1983 allocated quantities of water to the Forest for: existing and forseeable administrative and nonadministrative consumptive uses, springs and seeps, and nonconsumptive instream flows. Instream flows were granted for the purpose of maintaining favorable conditions, which constitutes the use of water to maintain streamside vegetation and to carry sediment through the channel system.

Most consumptive needs were quantified and granted for each individual Forest use. Other consumptive needs, including that of foreseeable uses and spring and seep flows, were given block grants. Instream needs were granted at specific quantification points throughout the Forest. The details of all such uses are in the Planning Records.

Non-Forest Uses. Water produced on the Forest is used downstream for a variety of purposes. These purposes include the following.

- Irrigation. Agricultural production in the Basin is limited by late summer water supplies; seasonal irrigation demands are not concurrent with stream runoff. The lack of water storage capacity is pointed out by the deficit between irrigation water requirements and present water diversions (estimated to be about 400,000 acre-feet). The deficit can be offset by a combination of interbasin transfers and reservoir construction. There is no shortage of supply for providing late summer water; the Yellowstone Compact provides Wyoming with about two million acre-feet of water that presently leaves the State unused primarily during the spring runoff season. Production of water supplies is, therefore, focusing upon development of storage and transmission facilities. The Shoshone National Forest could be affected by developments of this kind, particularly along some of the major valley bottoms.

- Recreation. Present water yields, uses and developments adequately serve recreation needs on and off the Forest. On Forest, diversions at present do little to affect instream values related to recreation (such as asthetics and fishing). Off-Forest, recreation demands are currently being met, with the possible exception of fishing on some streams where flows are depleted during the summer months.

- Municipal. Water is used for domestic purposes in three communities whose supplies could be affected by Forest management. There has been no indication from these municipalities that such effects are occurring. The inventoried municipal watersheds (FSM 2543.4, R-2 Supplement, No. 5) on the Shoshone National Forest are shown below.

Watershed	Community Served	Ranger District
South Fork of the Shoshone River	Cody, Wyoming	Wapiti
Wood River	Meeteetse, Wyoming	Greybull
Middle Popo Agie River	Lander, Wyoming	Lander

- Fish Habitat. Streams, lakes, and reservoirs on the Forest, and in the Basin in general, can support more than the present fishing pressure. The capacity will, of course, change if habitat is reduced by degradation in quality or quantity of water. The thrust of recent instream flow propositions that have been debated in the State legislature has been to maintain or increase habitat.

- Reservoir Storage and Transbasin Diversions. Wyoming is entitled to 80 percent of the unused and unappropriated water in the Big Horn River at the State line or about 1.8 million acre-feet per year. Wyoming's 60 percent share of unused and unappropriated water in the Clark's Fork River amounts to about 430,000 acre-feet for the average year. This water is not used for other than instream purposes in Wyoming due to the lack of storage or interbasin transfer facilities that would allow irrigable lands to come into production. There are presently six principal reservoirs within the Forest boundary and seventeen others on the west side of the Basin, including two major impoundments on the mainstem Wind and Big Horn Rivers.

There are at least two proposals currently in preliminary stages of development for dam and power generating facilities. Both are on the Clarks Fork District; one is on Sunlight Creek and the other is on Littlerock Creek.

The Governor's water development program published in 1982 proposed 26 surface water developments in Levels I to III. None of these projects would directly affect Forest land management. A bill was signed into law in 1984 perpetuating some projects and adding one that could affect the Forest. Funds were provided by the State legislature to perform a feasibility and impact analysis of water resource development in the Clark's Fork/Big Horn Basins.

Interbasin transfer proposals currently being considered do not appear to affect National Forest System lands. The greatest potential for such an effect lies in the Clark's Fork Basin where off-stream storage and several canal systems are contemplated.

Numerous potential water storage sites or projects lie on or would affect National Forest system lands. These are identified in water plans produced by the Wyoming State Engineer1/, and in both the Type IV Survey (Wyoming Supplement)2/ and the Level B Study3/ with some variations among them. All plans emphasize the need to develop storage facilities or interbasin transfer systems that will put to use the plentiful water supplies currently lost as spring runoff.

Water Quality. Water Quality has been monitored intermittently by the Forest Service during the 1970's. The inventory of water quality data is predominantly at the overview level. Some site-specific data has been collected for short periods of time. Long term monitoring has incorporated a limited number of samples. The inventory is generally inadequate to address specific issues, concerns, and opportunities relating to water quality.

A water quality monitoring plan for the Forest has been written and approved, but is yet to be implemented. The plan is designed to operate at different levels of inventory, depending on management needs or concerns, issues and legal requirements.

The U.S. Geological Survey (USGS) maintains no water quality monitoring sites on the Forest. Various special studies have been conducted by the the USGS, Wyoming Game and Fish Department and others, from which some data is available.

1/ Wyoming State Engineer's Office. The Wyoming Framework Water Plan. Wyoming Water Planning Program. 1973

2/ USDA. Forest Service, Soil Conservation Service and Economic Research Service in cooperation with Wyoming State engineer. Wind-Big Horn-Clark's Fork River Basin Type IV Survey. 1974

3/ Missouri River Basin Commission. Level B Study. Yellowstone River Basin and Adjacent Coal Areas. Wind-Big Horn-Clark's Fork Basin, Wyoming. 1977.

Problems relating to water quality or watershed condition on the Forest have been scrutinized in several published reports written cooperatively or singly by Federal and State agencies. The Type IV Survey formulated a comprehensive analysis of watershed problems on the Forest that is still current. The Level B Study concluded that the major water quality problem lies with fecal contamination from summer home groups and lodges. The Big Horn Basin 208 Plan1/ generally concluded that primary potential for water pollution lies with road construction, but that logging, grazing and recreation all may have an impact.

The Wyoming Study 1983 update, New Directions in Management2/, indicates that a major problem is the lack of hard, technical water data needed to guide Forest management. This is perhaps the most valid statement of the management situation in view of the diversity and scope of problems presented in other documents.

The Forest problem assessment (1981-1983) consists of specifics from the above studies, consultation with District Rangers, and the Shoshone Watershed Improvement Needs Inventory. A summary of the assessment is found in Appendix G of the Plan and is intended to convey several things: 1) watersheds that are (or are potentially) in declining condition from past and present management activities; 2) watersheds that may be significantly impacted by projected activities (such as oil and gas exploration and development); and 3) watersheds where monitoring activities and restoration techiques should be focused in the first decade.

By all assessments, suspended sediment is an important water quality parameter that is likely to be impacted by Forest management activities. As a result, the HYSED water resource analysis procedure (Silvey and Rosgen, 1981) was used to isolate watersheds that may be producing more sediment than is acceptable from a geomorphic and water quality standpoint. The analysis indicated that several watersheds exceed the sediment yield threshold, due primarily to existing roads. The major conclusion drawn, however, is that sediment yield data, field sampling of stream characteristics, and timber management data are severely lacking.

Water quality and aquatic habitat are "air quality-related values" (Clean Air Act as amended 1977; see Support Element - Air) in designated wilderness areas. This means the quality of these wilderness values could be affected by the quality of the air. The Fitzpatrick and Popo Agie Wildernesses contain numerous high elevation lakes and streams that have extremely low buffering capacities and therefore may be acidified by small additions of airborne sulfates or nitrates. Recent data collected on the adjacent Bridger-Teton

1/ Regional Planning Office. 208 Water Quality Management Plan, Big Horn Basin, Wyoming. U.S. Environmental Protection Agency and Wyoming Department of Environmental Quality. 1979.

2/ USDA Forest Service. New Directions in Management on the Big Horn, Shoshone and Bridger-Teton National Forests. Wyoming Forest Study Team. 1983.

Wilderness indicates that such lakes may be becoming more acid due strictly to existing sources of airborne pollutants. Water quality and acid deposition studies are proposed for these areas to help define present trends and changes in quality due to future energy related developments. Funding for continuance of this program is uncertain. There are no such efforts currently being proposed for the other designated wilderness areas on the Forest.

Demand Trends - Forest Demands. The demand for water will continue with expected increases in developed recreation use. Present and increasing allocation of range lands to livestock necessitates more water developments on many grazing allotments.

Demand Trends - Non-Forest Demands. The future demand for irrigation supplies will increase with population growth, storage expansion, and irrigation facility deterioration (loss of water transport efficiency). The placement of all additional Wyoming irrigable lands (within the Big Horn Basin) into production would require the diversion of an estimated 3.6 million acre feet of water. The limiting factor in supply and demand considerations, however, appears to be the amount of water in useable storage. Potential for the expansion or development of reservoirs as identified in the Big Horn Adjudication Decree lies in the following drainages: Brooks Lake, Warm Springs, Little Wind, Wiggins Fork, Louis Creek, South Fork Shoshone, Clark's Fork and Sunlight Creek.

Municipal demands will parallel population growth and economic expansion. Quantities available will be limited by the amount of storage, plus any groundwater supplies that exist.

With expected economic growth and expansion, particularly in energy related fields, recreational demands on the water resource will increase. The Wind/Big Horn/Clark's Fork Type IV Survey projects a deficit in supplies needed for outdoor recreation uses, including fishing.

Storage Facilities Development. Demands for non-Forest water uses will increase with expected population growth and economic expansion with total demand increasing to over 3.8 million acre feet. Agricultural development and production depends upon the available water in storage to support late summer irrigation needs. The estimated shortfall in water needed for irrigation was about 400,000 acre feet in 1974. Irrigation efficiency and available storage has not improved significantly since then. Supply is not the problem; the Yellowstone Compact allots about 2,000,000 acre feet to Wyoming that is not being used. Rather, the major problem lies with inadequate storage facilities.

The need for water storage facilities (or at least the pressure for such development) comes from several sources. The primary source, irrigation, is discussed above. Secondly, large recreation demands are satisfied by providing a water surface for boating, fishing and waterfowl habitat. Water marketing and generation of hydroelectric power are demands being heard more often. Needs for regulation of instream flows (as portrayed by legislative and popular initiatives in recent years) are likely to be met only by constructing instream storage facilities. Problem assessments identify the need for flood control on some of the major Forest streams; such control would take the form of storage facilities. The Forest, by virtue of higher elevations, surface water flows, natural recreation attractions, and topographic characteristics that are favorable for dam building and impoundment, can expect greater involvement in the future with such projects.

Changes in Forest Land Use that Affect Demand. Traditional Forest land uses are expected to remain near present levels or increase over time. Their effects on water quality and downstream beneficial uses, if any, are related to sediment or biologic pollutants. The significant emergent issue as far as land use is concerned, is oil and gas exploration, development and production. This holds the potential for both surface and groundwater effects, including a variety of chemical and physical pollutants that are new to most of the Forest. Should such development become active on the Forest, it is possible that the demand for water at quality levels necessary to support the various beneficial uses would not be met.

WETLANDS AND FLOODPLAINS

Included under this general heading are resources and values associated with wetlands, both riparian and nonriparian, floodplains, and stream and lake ecosystems. There is considerable overlap between this discussion and those for Water Resources and Fisheries, and as such, it is generally included under Water. The volume and nature of public comment regarding riparian resources justifies its inclusion under a separate heading, but much reference is made to the other sections.

It is estimated that about 51,000 acres of wetland and riparian habitat occur on the Shoshone National Forest (not including lakes). Of this total, about 10,000 acres are wetland ecosystems and the remainder are riparian ecosystems. These resources are managed under a variety of authorities but most directly according to Executive Orders 11990 (Wetlands) and 11988 (Floodplains). Forest Service policy and management guides proceeding from these orders is found in Forest Service Manual 2526 and 2527. By virtue of the relationship between riparian values or conditions and water resources, considerable weight for management of these areas stems from the Clean Water Act.

Wetlands

Current Use and Management. Much of the Forest's wetland component consists of the riparian/aquatic environment of perennial streams. Such wetlands recharge surface water flows, regulate flood flows, and filter sediments or other potential pollutants from slope runoff. Additionally, riparian vegetation provides a root matrix that stabilizes soils adjacent to the stream and mountain stream bank configurations.

During runoff, the streamside riparian areas are moisture saturated resulting in large amounts of overland flow which continues into July in numerous small channels. The filtering capability of the streamside zone becomes effective as the overland and small channel flows recede.

Wetland soils and vegetation improve water quality in adjacent streams by trapping and cycling nutrients, buffering temperature changes, and providing sites for sediment retention. For example, stream-related wetlands capture 10 to 20 percent of suspended sediment loads when over-bank flows occur (American Water Resources Association, 1979).

Streamside wetlands also inhibit downstream flooding by providing temporary water storage and by slowing stream velocities.

Other wetlands include lands bordering lakes, springs, slump depressions, and low spots in gentle terrain that tend to collect water. These are usually wet seasonally.

Wetlands which are not stream related function hydrologically to recharge ground water supplies. The dominant wetland type in the Washakie is the riparian zone adjacent to streams and rivers that functions to recharge surface water flows, to regulate flood flows, and to filter sediments or other potential pollutants from slope runoff. Additionally, riparian vegetation provides a root matrix that stabilizes soils adjacent to the stream including stream banks.

Apart from the hydrologic function of wetlands outlined above, these areas are subject to a variety of uses. Natural wetland vegetation provides forage for wildlife, stream shading, and cover for fish. The integrity of a streamside wetland area may relate to quality fish habitat for a considerable distance downstream.

For the same general reasons that wetlands are attractive to wildlife, (i.e., vegetation and proximity to water) livestock are also attracted to them. In some areas, substantial use is made of available forage by wildlife, livestock, and transportation stock. Wetlands adjacent to lakes and streams are focal areas for recreation, be it developed or dispersed motorized or nonmotorized. A number of the Forest's campgrounds are located on floodplain areas. Outfitter and other large group camps are nearly always located in or immediately adjacent to wetlands. Some wooded riparian areas produce commercially attractive trees; many of the best timber sites are adjacent to streams. Such areas have been logged in the past. On many landtypes of the Forest, typically the dissected mountain terrain, the most attractive locations for roads or other developments (from the topographic standpoint) are in bottomlands in or immediately adjacent to riparian areas. Consequently, some roads have been placed there.

Demand Trends. The demand for use of areas and their riparian dependent resources will parallel the increased demand for all forms of recreation, for forage (livestock and/or wildlife), for timber access and harvest, and for access to developable sites for minerals. Alternately, there is increased demand for managing these areas to protect the characteristics that make them so desirable for other resource uses.

Floodplains

Current Use and Management. The major function of floodplains is to convey larger than normal quantities of water. The floodplain identified for management purposes is that associated with a 100-year flood (a flood that has a one percent chance of occurring in any given year).

Floods are primarily the result of rapid snowmelt or rainfall augmented snowmelt. Intense thunderstorms can lead to flooding in some low elevation areas of the Forest. Due to the steep gradient of most Forest streams, floodplains are generally confined to narrow areas adjacent to stream channels. Many of the major channels are characterized by a wide, braided flow pattern that constitutes much of the floodplain width.

A relative lack of development in floodprone areas has historically resulted in little flood damage on the Forest system lands, but developments on private lands adjacent to the Forest in the Lander vicinity and on private inholdings within the Forest have frequently been damaged by flooding. Annual peak flows cause damage to private inholdings, rural roads, and pastureland on Sunlight Creek, a Clark's Fork river tributary, and the Clark's Fork mainstem. Similar damages occur immediately below the Forest on the Clark's Fork, Wind River, Horse Creek (tributary to Wind River) and Popo Agie River, affecting crop and pasture lands, water structures, roads, rural structures and urban facilites. Damages are greatly magnified in these areas by peak flows approaching the 100 year recurrence interval (Level B Coal Study, 1977).

Little damage occurs on the Forest from annual peak flows, apart from streambank loss and loss of trees immediately adjacent to some streams. Recurrence interval flows of five years or less are capable of causing considerable damage to trails and local roads due to failure of drainage controls and culverts. Twenty-five year floods would likely damage some major stream crossings, where the structures are more than ten years old. Flood events of the 100 year magnitude will disrupt the Forest's trail system and cause damage to local, collector and some arterial roads. An estimated fifty percent of the Forest's campgrounds would be damaged to some degree during a 100 year event. In 1981, localized flooding estimated at one and a half times the 100 year flow, damaged or inundated nearly all the campgrounds in the North Fork Shoshone River corridor. Several major bridges and sections of road were lost, along with aggravated levels of the types of damage that occur during lower peaks. Access to some recreation lodges, campgrounds and trailheads was lost, leaving many people stranded until temporary structures could be installed.

The management imperative in floodplains is to reduce the risk of flood loss, minimize the impact of floods on human safety, and restore and preserve the beneficial values associated with them.

Demand Trends. The demands placed on values associated with floodplains will increase concurrent with demands for other uses, as discussed under Wetlands.

MINERALS

Process for Handling Mineral Activities

Forest Service policy toward mineral activities on National Forest System lands is guided by statutes and expressed in regulations, in statements of the President, the Secretary of Agriculture, the Chief of the Forest Service; and in the Forest Service Manual.

Minerals are fundamental to the Nation's well-being. The National Forest System, by coincidence of geology and geography, is a principal storehouse of mineral and energy resources. The search for and production of minerals and energy resources are statutorily authorized uses of the National Forest System, except for those lands formally withdrawn from mineral activities by Act of Congress or by Executive authority. Mineral activities on National Forest System lands are encouraged in accordance with the national Mining and Mineral Policy Act, the Acts governing mineral disposals from National Forest System lands, and the various applicable federal and state statutes governing protection of the environment, including air and water quality.

The Forest Service objective is to manage mineral related activities in a timely manner, and to integrate the exploration, development and production of mineral and energy resources with the use, conservation and protection of other resources.

The Wilderness Act of 1964, subject to valid existing rights, has withdrawn designated wilderness from all appropriation under the mining laws and minerals leasing acts. 1/ Wilderness study areas will receive minerals potential review in the next generation of Forest planning.

Statutory and regulatory direction separate mineral resources in publicly owned lands of the United States into three categories: locatable, leasable and salable.

Geology

Ores containing various minerals occur on the Forest in two general geologic environments: volcanic intrusive complexes and sedimentary deposits. Approximately one-quarter of the Forest is estimated to have high to moderate potential for locatable minerals. For a more detailed discussion of mineral occurrences and potential, see "Mineral Potential Report for Shoshone National Forest" by John S. Dersch, Geologist, USDA Forest Service - 1982. This report and a map displaying the same information is included in Appendix D. Common variety salable minerals such as sand, gravel, and building stone occur throughout the Forest.

Locatable Minerals

Locatable minerals are those valuable deposits subject to exploration and development under the U.S. General Mining Law of 1872 and its amendments. Commonly, locatables are referred to as "hardrock" minerals. Examples include, but are not limited to, deposits of iron, gold, silver, lead, zinc, copper and molybdenum. Citizens, and those who have declared their intent to become citizens, have the statutory right to explore for, claim and mine mineral deposits in Federally-owned lands subject to the U.S. Mining Laws, including those of the National Forest System. Through a memorandum of understanding with the Bureau of Land Management (BLM), U.S. Department of the Interior, the Forest Service administers most aspects of U.S. Mining Laws on National Forest System lands. In addition, under the regulations in 36 CFR 228, the Forest Service approves exploration and mining operating plans and administers those operations to ensure protection and reclamation of affected surface resources.

1/ For a complete discussion of minerals potential in the wilderness of the Shoshone National Forest, See "Wilderness Mineral Potential", Mars, USGS Professional Paper #1300, 1984, pgs. 1139, 1151, 1153, and 1165.

Current Use and Management. Exploration for base and precious metals has taken place periodically since the late 1800's. Upper Sunlight Creek, Needle Creek, Kirwin and South Pass are mining areas where the majority of mining activity has occurred.

The largest producing operation was the South Pass Mining Area where relatively low grade iron ore was mined and shipped to other points for refining. This open pit mine closed in 1983 due to failing domestic steel markets.

Exploration activity for precious minerals is high in the Kirwin area as well as the Needle and Silver Creek areas.

The Forest receives approximately six operating plans annually for locatable minerals. Table III-22 displays the total number of claims submitted on the Forest by District as of 1982.

Demand Trends. Exploration, development and production of locatable minerals will continue to be dependent on market prices. With increased prices, more activity will probably be directed toward locatable minerals, especially base and precious metals.

TABLE III-22

Number of Mining Claims by Ranger District - 1982

Clarks Fork	509
Greybull	570
Lander	160
Wapiti	597
Wind River	362
Total	2,198

Leasable Minerals

Federally-owned leasable minerals include fossil fuels (coal, oil, gas, oil shale, etc.), geothermal resources, potassium, sodium, carbon dioxide, phosphates and sulphur. These minerals are subject to exploration and development under leases, permits or licenses granted by the Secretary of the Interior. The controlling statutes currently are the Mineral Lands Leasing Act of 1920 and amendments, the Mineral Leasing Act for Acquired Lands of 1947 and the Geothermal Steam Act of 1970, whichever applies to the particular resource. The Secretary of the Interior's authority is administered by the Bureau of Land Management. When National Forest System lands are involved, the BLM requests the Forest Service's recommendation for minerals, other than coal, subject to the 1920 Act, or the Forest Service's consent decisions for minerals subject to the 1947 and 1970 Acts and for all coal deposits. Forest Service recommendations for and consent to the BLM for leasing, permitting or licensing (except for coal) include appropriate stipulations to be included in the issued document for the management of surface resources. The Secretary of the Interior, through the Office of Surface Mining (OSM) for coal and through the Bureau of Land Management for other minerals, has the authority to administer operations on leased National Forest System lands.

Table III-23 displays the acres which are open to leasing.

TABLE III-23

Estimation of Acres Available for Oil and Gas Leasing

ACRES NOT AVAILABLE FOR LEASING		
Designated Wilderness*	1,379,048	
Wilderness Study Area**	14,700	
Dunoir Special Area**	28,987	
Grizzly Bear Situation I outside Wilderness**	66,650	
Wild and Scenic River**	6,660	
Research Natural Areas*	1,680	
Beartooth Highway Withdrawal*	410	
Total	1,498,135	1,498,135
ACRES AVAILABLE FOR LEASING		934,990
TOTAL FOREST ACRES		2,433,125

* Legislatively withdrawn from oil and gas leasing.
** Forest Service recommends No Lease to Bureau of Land Management.

Prior to approval of operating plans, the Forest Service participates with BLM or OSM in the formulation of the site-specific terms and conditions of operating plans, so that the plans provide appropriate mitigation measures to ensure that adverse impacts on surface resources will not exceed applicable environmental protection standards. Plans must be designed to minimize the impacts of operations on other uses and surface resources and to provide for prompt reclamation or restoration of affected lands upon abandonment of operations. All such plans and activities shall be an outgrowth of environmental analysis that complies with NEPA procedures.

Current Use and Management. There are approximately 400 oil and gas leases on the Forest. There are also about 140 pending lease applications. The Forest receives and processes between 50 and 100 lease applications annually.

To date, 30 oil or gas exploratory wells have been drilled on the National Forest. None of these wells have been developed because of the lack of produceable quantities or poor quality of oil or gas. Currently, there are 13 Applications for Permit to Drill (APD's) under consideration on the National Forest.

Several small oil and gas fields occur immediately adjacent to the National Forest boundary at Four Bear, Grass Creek, T-E and Rose Creek.

High potential for oil and gas accumulation occurs mainly on the Wapiti and Greybull Ranger Districts from Carter Mountain to Owl Creek (USGS Open File Report 81-667).

There is a low geothermal potential as evidenced by a few hot springs near the Forest boundary along the Wind River. Historic and current interest in the development of geothermal resources on the national Forest has been very low. There has been some concern expressed in regard to the effect of geothermal development, and deep well drilling in general, on the geothermal phenomena in Yellowstone National Park.

Demand Trends. Exploration for and development of oil and natural gas resources is expected to increase in the future. The level of activity will be based upon price of the product versus cost. A major effect of these activities on the Forest would come from support facilities such as roads, pipelines and electric transmission lines.

Salable Minerals

Salable mineral materials or common variety minerals are generally low value deposits of sand, clay and stone that are used for building materials and road surfacing. Disposal of these materials from the National Forest System is totally at the discretion of the Forest Service. Requirements controlling salable mineral material operations are similar to those for leasable minerals.

Current Use and Management. About 45 sales of common variety minerals are made annually. These are primarily for gravel source material and decorative building stone.

Demand Trends. Demand is expected to remain constant or increase slightly. Decorative stone sources are limited and there are ample gravel sources available on private lands adjacent to the Forest.

HUMAN AND COMMUNITY DEVELOPMENT

The Shoshone National Forest is committed to the nationwide program emphasizing human and community development. This program includes activities that provide work and learning experiences for various segments of our population and communities; i.e. unemployed youth, senior citizens' employment opportunities, adult training, and college level credit work experience.

Though somewhat limited in opportunities due to location, population make-up and accessibility to large population centers and institutions of higher learning, the Forest has been actively engaged in a variety of manpower and human resource development programs for a number of years. A summary follows:

Senior Community Services Employment Program (SCSEP) - This program provides employment and job market retraining for the low income and elderly, age 55 and over. Presently, the Shoshone National Forest has a total of nine (target level being eight) enrolled in the Program. In FY 1983, work valued at $56,016.00 was accomplished.

Comprehensive Employment and Training Act (CETA) - Designed for employment of youth between the ages of 16 and 21. In FY 1983, seven participants were employed in this program with an appraised value of $8,392.00. For 1984, six youths were enrolled in the CETA program.

College Work Study Program - Provides work experience and employment to low income college students, last used in FY 1979. Under this program, the Forest Service may pay thirty-five percent of the gross salary, including five percent for administrative costs.

College Intern Program - Provides credit non-income work experience for graduate and undergraduate students. Considerable emphasis is being placed on this program in conjunction with the volunteer program.

Youth Conservation Corps (YCC) - Participation in this program occurred during the summer periods of FY 1976 through FY 1980. The last YCC camps consisted of one five-day, thirty-two enrollee camp on the Wapiti Ranger District (1980), and one seven-day, thirty-two enrollee camp on the Wind River Ranger District (1979). Appraised value of work accomplished was listed at $79,029 for the Wapiti and $39,138 for the Wind River. Due to funding constraints in FY 1981 thru 1984, there have been no additional YCC camps. Two YCC enrollees are worked on the Lander District in FY 1984, with a total participation of twenty-four enrollee weeks. The enrollees were from the local community; they were integrated with the regular seasonal work force.

Volunteers in National Forest Program - This program is used extensively to supplement the seasonal employment program, including positions such as campground hosts, trail maintenance, wilderness rangers, etc. About four person-years were utilized in FY 1982, with a work value of $61,328.00. For FY 1983, a total of 8.9 person-years were utilized with a work value of $103,790.00. Increased reliance on this program is expected in the future as funding for these tasks continue to decline.

Cooperative Education Program - Designed to infuse the Forest Service with new professional personnel while providing students with paid job opportunities and work experience prior to their permanent appointment. Participation in the program last occurred in FY 1980 and 1981. Limited use of this program is seen in the foreseeable future, due to funding constraints.

Stay-in-School Program - Provides part-time jobs for high school students to help keep them in school while gaining on-the-job work experience. In FY 1982 and 1983, one student was employed. In FY 1984, one student was employed on the Clark's Fork Ranger District, through Northwest Community College, performing clerical duties.

Demand trends. The outlook for federally funded or Forest budgeted manpower and youth training programs is not encouraging due to current and foreseeable budgets. As a result, increased participation can be expected in the volunteer and college intern program. However, if funding is made available, all dollars programmed to the Shoshone National Forest could be consumed by Human and Community Development programs.

SUPPORT ELEMENTS

LANDS

Current Use and Management. Table III-24 is a summary of the land use permits on the Forest. A current trend of rural private land being subdivided for residential purposes will undoubtedly cause an increase in unauthorized occupancies. It is anticipated that ongoing surveys of township and property boundaries will identify more cases.

There are some lands of other ownerships within the National Forest boundary. These primarily resulted from homestead claims, cash entry (purchases), and patents (1872 Mining Law). See the section titled "Land Status" for present acres of National Forest system land and State, private, and other lands.

Demand Trends. Private interest in landownership adjustment is expected to remain constant or increase as witnessed by the six land exchange proposals currently on file. As private developments increase, landowner interest in adjustments will increase in an attempt to resolve access difficulties, reduce subdivision costs and increase investment benefits.

TABLE III-24

Summary of Land Use Permits as of December, 1984

Type of Use	Number of Permits
Recreation Uses	129
Agricultural Uses	41
Utility & Communication Use	67
Water Uses	78
Transportation Uses	21
Other	15
Total	351

Special Land Uses

Current Use and Management. The Shoshone National Forest has 351 special use permits including 19 for resorts, lodges and ski areas. In addition to the 351 use permits, the Shoshone issues approximately 110 permits for outfitter and guide base camps, annually. A detailed analysis of the Forest's capacity for horse supported, large group camps has been ongoing and a determination of capacity has been made (see Appendix H).

Demand Trends. Demands for special uses on the Shoshone National Forest have been increasing recently. For instance, there has been an increase of five percent per year in the number of special use permits issued in the past five years.

Property Boundary Locations

Current Use and Management. Property boundary location on the Forest has been conducted on a part-time project basis. Past accomplished miles of boundary location and posting are shown below:

Year	1979	1980	1981	1982
Miles	15.5	6.5	8.0	14.0

The accomplished miles of boundary location and posting are dependent on available funding. Priorities for location come from District Ranger requests for timber sale support and trespass cases.

Demand Trends. There are an estimated 1,250 miles of needed property boundary location on the Shoshone National Forest. Need to locate and post will increase with increased timber management activities, increased recreation use, more intensive grazing systems, and as private lands are developed.

Rights-of-Way

Current Use and Management. Because of the variety of land ownership patterns adjacent to the Forest and lack of rights-of-way (ROW's), access via roads and trails to the Forest is often uncertain. Many acres of Forest land are unavailable for public use because of insufficient access. Adjacent landowners often enjoy nearly exclusive use of public land through control of access points.

The Forest has had a target of acquiring two rights-of-way annually. This level is indicative of the relatively low funding available for ROW acquisition. Current emphasis is on acquiring ROW's where access-related problems are greatest and where property owners are most willing to grant or sell easements.

Reluctance to grant rights-of-way will likely increase as more users cause vandalism and harass private property owners.

The present estimate of ROW needs by District is shown in Table III-25.

Demand Trends. Increased access for the general public is a major issue on the Forest. This demand for access (and hence, rights-of-way) will increase as the population in northwest Wyoming grows. Increased demands for access and subsequent rights-of-way will be caused by increased levels of recreation use and demands for more timber harvest or other commodity uses.

TABLE III-25

ROW Needs

Ranger District	Miles
Clark's Fork (17 roads)	22.8
Greybull (41 roads)	138.9
Lander (18 roads)	58.2
Wapiti (11 roads)	22.5
Wind River (16 roads)	34.6

SOILS AND GEOLOGY

Soils on the Shoshone National Forest are complex, reflecting the wide range of geologic types (parent material), topographic features and ecological conditions that exist. Vegetation patterns, landforms, and soil characteristics (such as natural erosion rates) vary tremendously within short distances across the landscape.

About 22 percent of the Forest is in the alpine zone. About 20 percent of this alpine zone occurs as rolling uplands, broad mountain tops or plateaus which have moderately deep to very deep, cobbly loam soils forming in residuum or glacial till. Rock outcrop is common on these units. About 45 percent of the alpine occurs as glacial cirques, aretes, cirque basins and associated narrow glacial valleys which have highly variable soils. Rock outcrop, tallus and rubble slopes are common on the cirque and arete walls while very deep, very cobbly loam soils in the cirque basins and narrow glacial valleys. Dissected mountain slopes comprise the remaining 35 percent of the alpine zone and have shallow to deep, cobbly loams. Natural erosion rates vary from nearly 100 tons per acre per year to zero. Accelerated erosion rates (potential human-caused) vary from moderate to very high. Generally, the potential accelerated erosion rate is high in the alpine zone on land types that are suitable for management.

About 72 percent of the Forest is in the climatic zone that supports timber. Not all acres in this forested zone actually support timber; included are steep slopes with warm to hot exposures, rock walls, and rocklands. Such areas will not support any vegetation or will support only grass or shrubland vegetation communities. Rolling uplands, often near timberline, comprise about 15 percent of the timber zone. Soils are cobbly to stoney loams or clay loams, ranging in depth from moderately deep to very deep. Rock outcrops and very shallow soils are common inclusions. Very steep glacial valley walls and rocklands comprise about 30 percent of the Forest zone. Soils vary greatly in depth and texture. Bare soil areas are common. However, most soils occurring in this are shallow to moderately deep, very cobbly loams or sandy loams. About 40 percent of the Forest zone occurs as dissected mountain slopes. Warm to hot aspects occurring in this category commonly support grassland, shrubland or a very open, widely spaced forest intermingled with grass lands. Soils occurring on the warmer slopes are shallow to deep, to gravelly to cobbly loams or clay loams. Soils occurring on the cooler aspects are moderately deep to very deep, very cobbly loams to clay loams. About ten percent of the forested zone occurs as low relief, undulating landslide debris and glacial till landscapes. These have deep to very deep gravelly loams and clay loams. About five percent of the forest zone is comprised of narrow valley bottoms having very deep loam, to very gravelly loam or sandy loam soils. The natural erosion rate varies from zero to nearly 28 tons per acre per year in the forested zone. The potential accelerated erosion rate ranges from low to high. Generally, the accelerated erosion potential is moderate for lands suitable for management in this zone.

About five percent of the Forest's soils wholly support grassland, shrubland or riparian vegetation. There are other soils which support grassland or shrublands in association with forested land as described above. The soils described here either occur wholly below timberline or are wholly meadow or shrubland soils. About 35 percent of the grassland/shrubland zone occurs on glacial till, glacially scoured uplands or landslide debris landscape. These lands are smooth to undulating and have very deep cobbly sandy loams to warm soils. Another 35 percent occurs on dissected mountain slopes. These are steep, mountain slopes and have moderately deep to deep and cobbly loam to clay loam soils. Another 15 percent of this zone occurs on lacutrine soils or alluvial bottomland soils along drainage bottoms. These support wet meadow types or riparian vegetation and have a high water table and very deep soils, ranging in texture from clay loam to gravelly and cobbly sandy loam. The natural erosion rate varies from zero to about five tons per acre per year. The potential accelerated erosion rate varies from low to high. Generally, the accelerated erosion potential is high for lands suitable for management in this zone.

Less than one percent of the Forest occurs as badlands. These are very steep, highly dissected foothills with young, rapidly eroding soils. The natural erosion rate is very high. The potential accelerated erosion rate is low in comparison.

Current Management. The objective of soil management on the Forest is to match management activities to the capability and suitability of the soil to assure long-term productivity. This can be done where the soil has been inventoried and soil characteristics are known.

About 50 percent of the Forest has been surveyed to national standards. Most of the wilderness and approximately 200,000 acres of nonwilderness remain to be surveyed (see Table III-26).

Currently, it is estimated that approximately 24,000,000 tons are eroding Forestwide each year through natural erosional processes. This estimate is probably low because it only accounts for the finer soil particles being eroded through surface erosional processes. Other erosional processes such as rockfalls, colluvial failures, and common stream blowouts are not included. However, erosion values resulting from these processes are reflected in the sediment values.

TABLE III-26

Status of the Soil Survey on the Shoshone National Forest

Survey Area Number	Surveyed Acres
677	247,891
656	823,500

Accelerated erosion (man-caused) is estimated to be approximately 400,000 tons per year. This includes erosion sources such as roads, trails, range improvement projects and timber harvesting activities. Most management takes place on soil, landform and vegetation communities that have inefficient sediment delivery properties. Hence, much of this erosion does not move into the stream system.

The Forest currently has about 900 acres of inventoried project work in declining watersheds. An additional 1500 acres of project work has been identified as contributing to stable but unsatisfactory watershed condition. The total drainage area estimated to be in declining watershed condition, as affected by the 900 acres of needed treatment, is 201,000 acres. The project inventory is estimated to be 40 percent complete.

Demand trends. The Forest Service objective is to complete the soil survey of all National Forest lands by 1995. To meet this target, the Forest has scheduled soil surveys beginning in 1989 through 1995 to accomplish approximately 1.36 million acres of inventory.

FACILITIES

Transportation

Current Use and Management. The Shoshone National Forest has 1,583 miles of roads and 1,294 miles of trails on its transportation system. In the past, roads on the Forest have been developed primarily for timber and prospecting access. Most system roads currently being constructed on the Forest are associated with timber sales. The relatively high mileage of trails and low mileage of roads, when compared to other Forests, reflect the predominately wilderness and roadless nature of the Shoshone National Forest.

Forest Development Roads are classified by road type - arterial, collector or local. These are defined as follows.

Forest Arterial Roads provide access to large areas and usually connect with public highways or other Forest arterial roads.

Forest Collector Roads serve smaller land areas and are usually connected to a Forest arterial or public highway.

Forest Local Roads normally serve terminal type facilities and are connected to either a Forest collector, arterial or public highway.

Of the 1,583 miles of roads in the system, 29 percent are classified as arterial or collector and the remaining 71 percent are local roads. Existing road surfaces are identified as one of four surface types: asphalt, aggregate, graded and drained, or primitive (see Table III-27).

TABLE III-27

Existing Road Classification and Conditions

Surface Type	Miles Arterial	Collector	Local	Total
Asphalt	35.5	14.0	5.4	54.9
Aggregate	78.0	30.7	24.9	133.6
Graded and Drained	13.8	214.7	190.4	418.9
Primitive	0	70.0	905.5	975.5
Total	127.3	329.4	1126.2	1582.9

There are currently five levels of road maintenance on the Shoshone National Forest which are performed by the Forest Service, counties, and Forest users. The total number of miles in each level is listed below. The large number of miles in Level 1 does not mean the road is closed, but indicates a lack of funding for maintenance at a higher level. Some Level 1 roads are physically closed to traffic. As funds become available, other Level 1 roads are closed or assigned a higher maintenance (see Table III-28). The Glossary in Chapter VII contains a complete description of each road maintenance level.

Road maintenance funds have not been sufficient in recent years. The result has been an overall shortening of road design life resulting in more frequent expenditures for reconstruction. Recent efforts to maximize benefits of the road maintenance funds available have included road closures and commercial traffic management.

Highway U.S. 212, northeast access to Yellowstone National Park, is maintained entirely by the National Park Service, although jurisdiction still remains with the Forest Service. Any reconstruction of this route is done by the FHWA (Federal Highway Administration) in full cooperation with the Forest Service.

TABLE III-28

Road Maintenance Miles

Maintenance Level	Miles
Level 1 Custodial Care	326
Level 2 Limited Passage	944
Level 3 Safe for Car	246
Level 4 User Comfort	29
Level 5 High Volume Traffic	38

Highway 296 (FDR 100) is a Forest Highway that is being reconstructed and paved by the Wyoming Highway Department (WHD). The State is assuming maintenance responsibility for that road as it is reconstructed, section by section. Maintenance for the unpaved part, currently about 30 miles, is shared by Park County and the Forest Service.

The Forest has proposed, and the FHWA has accepted, the Louis Lake road for designation as a Forest Highway.

All other primary and secondary highways on the Forest are maintained by the WHD. Construction activities are coordinated with the Forest Service throughout the life of a road.

The WHD has a maintenance camp on the Forest at South Pass, and another on their own land at Russell Creek on the Clark's Fork Ranger District. The Park Service has a maintenance camp near Muddy Creek on U.S. 212 on the Clark's Fork Ranger District.

Temporary roads constructed for single purpose projects are usually obliterated following the project. Some primitive roads which are not on the transportation system are being scarified and seeded.

Under current management, a variety of road and trail closure techniques are employed to serve several resource protection needs. Seasonal or year-round closures are used to prohibit on- or off-road use on large areas of the Forest. For the most part, these closures are implemented to protect the soil, water, and wildlife resources.

Local roads that have been built to serve a short-term need, but which will be needed again in the future, are commonly closed by gates to restrict vehicular traffic. This minimizes maintenance needs and helps protect other resources.

Of the 1,294 miles of existing trails on the system, 31 percent are classified as being inadequate and needing either reconstruction or relocation and new construction. About 70 percent of these trails are located within the Forest's wildernesses.

Currently 30 miles of trails are being maintained by user or trail organizations and the remainder (about 1,264 miles) by the Forest Service. For the past several years, funding has been at a level that allows for only minimal maintenance. All miles are maintained, but only about a third of the needed work is done. Funds are used primarily to keep the trail system open with few efforts directed toward preventive maintenance, due to budget constraints.

Trails where motorized use is not permitted are usually signed accordingly, and shown with the appropriate notation on the Shoshone National Forest Travel Management Map. Areas of the Forest that are generally thought to be more resistant to motorized use are open to such use, but with some restrictions.

Demand Trends. Demands on the transportation system are directly related to demands for recreation, timber management, range management, minerals and other land use activities. As recreation use increases and demands for vegetation management increases, a corresponding demand for an improved transportation system will occur.

Fire, Administrative and Other Facilities (FA&O)

Current Use and Management. There are currently eleven administrative sites within the Forest boundary, and one adjacent to the boundary on BLM land. Nine of these sites serve as Ranger Stations and work centers. The Wapiti Ranger Station is occupied year-round and the remaining administrative sites are used seasonally.

Most of the FA&O facilities were constructed about 50 years ago. Maintenance has been minimal over the years, but considering age, the structures are in reasonably good condition. Through the use of normal FA&O maintenance funds, and energy retrofit and safety improvement funds, most are fairly sound. Some water and wastewater system problems are becoming more frequent and will require reconstruction in the near future.

Currently, there are no major transmission utility or water transmission corridors on the Forest. There are approximately 40 miles of microwave paths.

Demand Trends. Existing structures are generally adequate for their intended use. Additional crew quarters are badly needed at the Crandall Ranger Station. New water systems are needed at four sites. New waste water systems will be necessary in the future at three sites.

PROTECTION

Fire Management

The fire management program on the Forest is a coordinated interagency effort involving federal, state and county organizations in northwestern Wyoming. The Forest is also the Coordination Center for all federal, state and county organizations that have cooperative fire agreements in the State of Wyoming.

During the period 1971 to 1980, the total cost of fire suppression was $2,765,000 and budgeted protection costs were $1,172,264. The total cost for each acre burned was $745.

Table III-29 shows fire occurrence by year and by cause and size class for the analysis period. Additional data regarding fire classes and size are available in the planning records.

Current Use and Management. An analysis of the period 1971 to 1980 was performed to get base data to evaluate the fire situation on the Shoshone National Forest. The most recent decade was used to represent current management practices. During the period 1971 to 1980, the Shoshone National Forest experienced 280 fires of which 128 were lightning (total of 693 acres) and 152 were people-caused (4,588 acres). Of those fires, nine lightning fires and 11 people-caused fires were 10 acres or more in size. Total acreage burned, regardless of cause, was 5,282 acres.

TABLE III-29

Fire Occurrence

Year	Size Class A, B, C 1/	Size Class D+ 2/	People-Caused	Total Acres Burned
1971	12	0	1	54
1972	15	0	7	1
1973	34	0	16	87
1974	39	1	19	1186
1975	25	1	18	465
1976	33	2	19	1990
1980	27	1	17	234

1/ Less than 100 acres.
2/ Greater than 100 acres.

Integrated Pest Management

Insects and disease act as both beneficial and destructive agents, and they are a part of Forest ecosystems. They play an important role in microclimate energy balances and perpetuation of habitat for a variety of wildlife species. Conversely, vegetation mortality, defects, and growth reduction directly attributable to insects and disease, result in substantial economic and social costs.

Current Use and Management. Forested areas are currently undergoing insect and disease problems from three dominant sources, discussed below.

MOUNTAIN PINE BEETLE (Dendroctonus ponderosae) is a serious pest on the Shoshone National Forest. An infestation in lodgepole pine has been occurring on the Lander Ranger District since the late 1960'S. Silvicultural treatment was proposed as a means of reducing the acreage of susceptible trees and increasing stand diversity. However, when beetle activity declined in the mid 1970's, interest in silvicultural treatment waned. By 1980, the beetle population was of epidemic proportions and control measures began on National Forest System and private lands on a limited scale.

The Forest's timber management program in past years has not been at a sufficient level to apply the stocking control and harvesting of mature timber necessary to maintain healthy, vigorous stands in tentatively suitable timber lands. As a result, many areas now are susceptible to epidemic insect populations. Currently, lodgepole pine stands which became established near the beginning of the twentieth century are the most susceptible.

DWARF MISTLETOE (Arceuthobium spp.) is a widespread disease of lodgepole pine on the Forest. To date, approximately 2500 acres of lodgepole pine have been treated for dwarf mistletoe control beyond the normal timber sales program.

COMMANDRA BLISTER RUST (Cronartium Comandrae) is prominent particularly in the Wind River drainage as a result of an epidemic that started in the late 1940's. As a result of the disease, large acreages of lodgepole pine exhibit dead tops and have lost significant timber volume.

The predominance of mature timber stands on the Forest provides conditions suitable for a number of other diseases such as broom rusts, decaying agents and cankers. While none of these disease cause unacceptable losses Forest-wide, they have some negative impact on other resources such as visual quality and recreation.

Demand trends. The long-term goal of the integrated pest management program is prevention rather than emergency suppression of insects and diseases. A variety of silvicultural activities can help prevent insect and disease problems. They include clearcutting, slash disposal, site preparation for regeneration, commercial and precommercial thinning, timber stand improvement and partial cutting. It is important to identify and prioritize timber stands according to susceptibility to insects and disease so the highest risk stands are scheduled for treatment first. This will help ensure the maintenance of a healthy forest condition on that portion of forested land that is accessible and suitable.

AIR

Current Management. The management of the air resource on the Forest, in response to the Clean Air Act (as amended), should be directed toward maintenance of public health and welfare, and preservation or enhancement of recreational, historic or scenic values. Clean, clear air is valued by most Forest visitors as a part of their experience travelling through or recreating on the Forest. Other Forest resources, particularly in wilderness areas, are dependent upon clean air and are valued not strictly in human terms, but also carry intrinsic value (Wilderness Act of 1964).

Class I Air Quality Areas. The Prevention of Significant Deterioration (PSD) provisions of the federal Clean Air Act designated those wilderness areas over 5000 acres in size and in existance as of August 7, 1977, as Class I. The remainder of the country that was attaining air quality standards was designated Class II. New wilderness, or additions to existing wilderness, was to retain its Class II designation. For Class I areas, the Clean Air Act gave the Forest Service the responsibility to protect air quality related values (AQRV's) from adverse impacts of air pollution. Air quality related values include any value of the wilderness that may be impacted by changes in air quality, such as flora, fauna, soil, water, visibility, cultural or geologic features and odor.

While the Clean Air Act is specific only to Class I wilderness, the Wilderness Act of 1964 provides for protection of all wilderness values in all wildernesses. Therefore, Region 2 of the Forest Service has developed a policy of protecting air quality related values in all wildernesses within the Region (FSM 2120 R-2 Supp).

The Forest Service carries out its responsibility under PSD by making recommendations as to whether or not permits for certain new air pollution sources should be issued by the State. In order to make informed recommendations, the Forest Service needs an adequate data base on the existing chemical, physical and biological conditons of the most sensitive AQRV's. Such a data base does not currently exist for the wildernesses on the Forest. However, the Shoshone and Bridger-Teton Forests have developed monitoring plans and have begun to collect the above information. The monitoring plan was developed as a result of the proposed new air pollution sources immediately up wind of the Wind River Mountain Range and the extreme sensitivity of a large percentage of the lakes at the higher elevations. Preliminary results of monitoring indicate that most lakes in the Wind River Range have extremely low buffering capacities and are therefore susceptible to acidification by airborne pollutants. Hence, the need has been demonstrated for a long-term program to monitor sensitive receptors for AQRV protection in all the Class I areas.

Class II Air Quality Areas. Class II areas are those determined by the State to be in compliance with the ambient air standards defined in the Act. All areas of the Forest outside of Class I are Class II. Allowable increments of pollution are defined in the Act for Class II areas. Forest management practices such as prescribed burning or road construction can emit air pollutants regulated by the State. However, in all cases mitigating measures can be taken to assure that no ambient air quality standards are exceeded.

Demand Trends. Demand for quality air is partly defined by the expectations of Forest users, as well as people who reside or recreate adjacent to the Forest. It is further defined by State and Federal standards that concern not only ambient air, but also air quality related values such as visibility, water quality, and vegetation productivity.

With anticipated growth in population and increases in recreation use on the Forest, demand for a quality experience will increase. This can be interpreted as demand for air quality at expected high levels. Concurrent with this growth will come greater pressures on the resource itself and greater emphasis on its protection.

WILD AND SCENIC RIVERS

The Clarks Fork of the Yellowstone River has been evaluated and recommended for designation as a wild river in an EIS dated February, 1979. This recommendation received administrative approval and was introduced in Congress on September 13, 1982. Some local water users are opposed to this designation, at least until a development study for the River can be produced. A Federal Energy Regulatory Commission (FERC) withdrawal with an application for hydroelectric facility construction is pending on Sunlight Creek which is a tributary of the River. Since construction of this facility could affect the character of the River, there is some concern about its protection prior to inclusion in the system. The protection period expired September 13, 1985.

In 1979, the Heritage Conservation and Recreation Services (HCRS, whose functions are now part of National Park Service) began a nation-wide inventory of potential wild and scenic rivers in response to Presidential directive and direction given in the Wild and Scenic Rivers Act (October 2, 1968 as supplemented and amended). The Wiggins Fork of the Wind River was identified in this inventory. The following is a summary of the eligibility evaluation conducted by the Shoshone National Forest interdisciplinary team.

> Free-Flowing Character: There are no major water developments within the HCRS study area. Therefore, the entire length meets the free-flowing criteria.
>
> Outstanding Remarkable Values: Motorized and nonmotorized recreation opportunities such as hunting, camping, and hiking are available in the area. The quality and quantity of these opportunities are common throughout Northwest Wyoming.
>
> Fishing values are low due to a lack of cover, short growing season, unstable channels, spring blowouts, and summer low flows. The river is incapable of sustaining substantial fishing pressure.
>
> The variety class inventory illustrates that approximately 30 percent of the river corridor is variety class A, "Distinctive", and the remaining 70 percent is variety class B, "Common". This indicates that the aesthetic qualities in the study area are common to the Wind River drainage with few remarkable scenic qualities. Existing landscape conditions in a portion of the corridor are dominated by large clearcuts (up to 2,000 acres in size) created in the 1960's.
>
> There are no known cultural resource sites or artifacts in the study area. Some of the study area provides moose winter range and elk calving areas. While these values are locally important to wildlife, they are not outstanding or remarkable.
>
> The upper reaches of the River contain quantities of petrified and agatized wood that attract collectors. Because of the "in place" value of this resource and because of resource damages that have resulted from removal of these materials, collection has been prohibited within the Washakie Wilderness portion of the River corridor.

Eligibility Conclusion: The Wiggins Fork of the Wind River does not possess sufficient outstanding remarkable value; therefore, the river does not qualify for addition to the National Wild and Scenic Rivers system.

As a result of this evaluation and eligibility conclusion, the Shoshone National Forest will develop Forest Plan alternatives for multiple-use of the Wiggins Fork corridor. The Wiggins Fork of the Wind River eligibility report is in Appendix E.

RESEARCH NATURAL AREAS

There are no designated Research Natural Areas (RNA's) on the Shoshone National Forest at this time. Five sites have been inventoried and proposed for designation as an RNA's. A number of RNA's, including Meadow Lake, have been suggested by a task force of scientists and administrators at a recent Wyoming Natural Areas Conference. Location, acreages, and suitability have not been precisely identified but will be considered in the next decade or two as dictated by priority. Proposed RNA's are listed below.

Whitebark Pine. Picketts Knob, on the Wind River District (T43N, R109W, Sections 1, 2, 12, and 13), includes approximately 300 acres. Whitebark pine is predominant with various amounts of subalpine fir, Engelmann spruce and lodgepole pine. Most of the area is surrounded by steep escarpments and would be easy to protect.

Douglas Fir. Pat O'Hara Creek, on the Clark's Fork District (T54N, R103W, Sections 5, 6, 7, and 8), includes approximately 300 acres near the Dry Fork of Pat O'Hara Creek. The site includes a mature Douglas fir stand (ca. 200 years old), with a few limber pines scattered throughout.

Limber Pine. Bald Ridge, on the Clark's Fork District (T56N, R104W, Section 25 and 36), includes approximately 200 acres. The site represents limber pine forest, and occurs in patches of 10 to 20 acres with bluebunch wheatgrass grassland between.

Twin Lakes Alpine Ecosystem. Twin Lakes, on the Clark's Fork District (T58N, R104W, sections 17, 19, 20, 21, 28, 29, and 30), includes 726 acres. The area exhibits a Rocky Mountain alpine tundra vegetation type with associated cryopedogenic features. Extensive examples of alpine cushion plant, alpine turf, alpine meadow, and alpine bog vegetation in a late seral ecological stage are present. Cryopedogenic features include snowbeds, nonsorted circles and earth stripes, sorted circles and stripes, frost hummocks, frost boils, and solifluction terraces.

Sawtooth Peatbed - Permafrost. The Peatbeds, on the Clark's Fork District (T57N, R104W, section 29), includes approximately 160 acres. The Sawtooth Peatbed - Permafrost area is an unique landform. The landform consists of a palsamire (an elevated peatbed overlying permafrost) and surrounding subalpine wet meadow vegetation. In the palsamire, the peat acts as insulation for the permafrost which, on this site, is found at 15 inches below the surface.

IV. ENVIRONMENTAL CONSEQUENCES

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

OVERVIEW

Environmental consequences are the effects and impacts that would be expected to occur on the physical, biological, social and economic environment when implementing an alternative. Analysis and evaluation of consequences provides the basis for comparison of alternatives. The alternatives considered in detail in developing the Shoshone National Forest Land and Resource Management Plan are described in Chapter II.

Estimated effects of the alternatives result from the application of specific practices to specific areas of the Forest. A set of practices designated for a specific area of the Forest is termed a FORPLAN prescription. Environmental consequences were estimated for specific areas of the Forest assuming implementation of a given FORPLAN prescription on each analysis area. The specific effects of implementation of each FORPLAN prescription on each analysis area have been estimated. These estimates for each analysis area, for each alternative are in the planning records. What is presented in this Chapter, and summarized and compared in Chapter II, is the Forest-wide composite of effects on individual analysis areas.

Consequences presented in this chapter assume that practices are carried out according to the standards and guidelines contained in Chapter III, MANAGEMENT DIRECTION, of the Plan. The environmental consequences for all alternatives are limited by standards and guidelines which are intended to ensure the long-term productivity of the land and mitigate adverse environmental effects.

The Forest engages in some activities that do not involve significant environmental effects. These activities are categorized as routine operations, routine maintenance, or actions that produce short-term effects, individually and cumulatively. Examples of routine operations include operations administration, equipment purchases, custodial actions, and sign posting. Routine maintenance involves the repair, renovation, and upkeep of facilites such as roads and administrative sites. Actions that produce short-term effects which are controlled by a permit system include firewood gathering, collection of plant materials, some geologic studies, and placement and maintenance of climatological instruments. Some actions of limited size or magnitude have also been found to produce little or no negative effect on the environment, but this determination for future actions involves careful consideration by the Forest Supervisor. Some timber sales, range and wildlife improvement projects, watershed improvement projects, and other vegetation management may fall in this category (FR Vol. 46, No 223. November 19, 1981).

This chapter summarizes programs by resource element, displays output levels by alternative and describes the direct, indirect and cumulative environmental

best copy available

consequences that would be expected to result from implementation of each alternative. Direct environmental effects are defined as those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but which are nevertheless significant in the foreseeable future. Environmental interactions within alternatives can be very complex. Apart from direct and indirect effects, a change in one output can also have secondary effects resulting in changes in other outputs. Cumulative effects are those which result from the incremental impacts resulting from an alternative when added to other past, present, and reasonably forseeable future actions.

Estimates of outputs and effects for the next ten years were developed using the linear programming model (FORPLAN) and the resource-specific processes developed and documented in Planning Action 2, "Process Criteria for the Forest Plan." These predictions are based on quantification of the integrated relationships between the resources of the Shoshone National Forest. Projections of outputs and effects were also made for a fifty year time period. This was done to provide more information upon which to base decisions and to provide input to the RPA assessment. Relative differences between alternatives are obvious from the outputs and effects displayed for each resource (see Chapter II for a comparison of alternatives). Additional detail on the predictions for each alternative is included in planning records on file at the Shoshone National Forest Supervisor's office.

Benefits produced by management of the Forest can be categorized as either priced or nonpriced. Priced benefits can be market-valued such as timber, domestic livestock, and developed recreation; or nonmarket-valued such as hunting, fishing, dispersed recreation, and water yield. Priced benefits are included in present net value analysis. Nonpriced benefits include: certain outputs, such as threatened and endangered species; certain physical conditions such as areas with high quality scenery; certain distributional effects, such as where the high quality scenery or wildlife winter range is located; certain reductions in risk, such as timber species and age distribution control for control of insects and diseases; and social and economic considerations. Net public benefit analysis includes the results of present net value analysis and analysis of nonpriced benefits.

SUMMARY OF CHANGES BETWEEN THE DRAFT AND FINAL EIS

All alternatives were reformulated and reanalyzed between the draft EIS and the final EIS. This was done in response to issues and concerns as discussed in Chapter I. The mix of goods and services produced within each alternative changed slightly as displayed in Chapter II. However, the emphasis of each alternative did not change and relative differences between alternatives did not change significantly except in terms of economic efficiency and economic impacts. Major changes include:

- Timber: Acres selected for timber harvest decreased in all alternatives.
- Roads: New construction and reconstruction decreased in all alternatives.

- Economic Efficiency: Ranking of alternatives in terms of economic efficiency changed due to changes in timber costs, road costs, and recreation investments.

- Economic Impacts: Relative ranking of alternatives in terms of economic impacts changed because of a difference in the amount of commodities produced, including developed recreation.

- Outfitters and Guides: Alternatives B, D, and F called for more outfitters and guides than are being permitted currently while all other alternatives remained at current levels. In the final set of alternatives, every alternative calls for outfitters and guides to remain at current levels.

- Wetlands and Floodplains: To clarify discussions and add necessary details, a new section dealing with wetlands and floodplains was added.

Many other changes were made in this Chapter. Some involved rewriting discussions to clarify intent. Others involved changes in production of goods and services. Beyond the items listed above, all changes were minor.

DIRECT, INDIRECT, AND CUMULATIVE ENVIRONMENTAL EFFECTS

Environmental consequences result from the application of practices contained in the FORPLAN prescriptions carried out in accordance with the standards and guidelines as shown in Management Area Direction (Appendix G and Plan Chapter III). Table IV-1 shows the acreage of each Management Area in each alternative. (See Chapter II Introduction for a discussion of the relationship between FORPLAN prescriptions and Management Area Direction.)

VEGETATION

Vegetation is a dominant feature of the Forest's landscape. Forested lands are dominated by lodgepole pine, spruce, subalpine fir and Douglas fir cover types. Nonforested lands are dominated by alpine tundra, near-alpine grass and forb and grassland/shrubland plant communities. Transitional areas between nonforested and forested lands support widely spaced trees or clumps of trees of limber pine, white bark pine, or Douglas fir between and under which grass and shrubs occur. Aspen is a minor vegetation type occuring throughout the forested zone. The management of these vegetation types is an important theme of this document and the Forest Plan.

Vegetation management is a tool for attaining and maintaining healthy, diverse conditions of the Forest. The condition of the vegetation on the Forest influences nearly all other resources. Forests with a diversity of vegetation species (types) and ages provide the greatest variety of habitat for wildlife. Such forests are generally more resistant to insect and disease epidemics than those that are uniform in tree species and age. The desired distribution of vegetation types and ages (shown in Table IV-2) is that which is considered

TABLE IV-1

Management Area Acreage Summary

Management Area	Management Emphasis	Alternatives A Current	 B Commodity Emphasis	 C Non-Commodity Emphasis	 D Preferred	 E Reduced Budget	 F RPA
1A	Developed Recreation Sites	2300	2300	2300	2400	2300	2300
1B	Winter Sports Sites	600	600	600	600	600	600
1D	Utility Corridors 1/	2500	2500	2500	2500	2500	2500
2A	Semiprimitive Motorized Recreation	130,000	70,000	155,000	185,800	102,000	75,000
2B	Rural and Roaded Natural Recreation	170,000	180,000	233,000	161,400	165,000	125,000
3A	Semiprimitive Nonmotorized Recreation	260,000	165,000	299,000	417,300	475,000	296,000
3B	Primitive Recreation	13,000	0	18,900	15,300	20,000	11,900
4B	Management Indicator Species	22,500	22,500	22,500	22,500	22,500	22,500
4D	Aspen Management 1/	5500	3800	4800	4500	2300	3400
4F	Grizzly Bear Enhancement	0	155,900	12,900	0	0	81,300
5A	Big Game Winter Range (Nonforested)	34,600	34,600	34,600	34,600	34,600	34,600
5B	Big Game Winter Range (Forested)	3800	3800	3800	3800	3800	3800
6B	Livestock Grazing	183,000	168,000	45,000	0	81,000	179,000
7C	Management of Steep, Forested Slopes 3/	0	6200	0	0	0	0
7E	Wood Fiber Production	182,200	204,700	145,000	174,300	50,500	169,700
8A	Pristine Wilderness	138,000	136,000	151,000	145,500	139,000	145,000
8B	Primitive Wilderness	714,000	759,000	708,000	896,000	592,000	715,000
8C	Semiprimitive Wilderness	556,000	513,000	549,000	314,900	677,000	548,000
8E	Glacier Addition to Fitzpatrick Wilderness	6700	6700	6700	6700	6700	6700
9A	Riparian Area Management 1/ 2/	31,200	31,200	31,200	31,200	31,200	31,200
9B	Water Yield Increase (Forested Areas) 1/	0	800	5000	0	0	800
9C	Water Yield Increase (Nonforested Areas) 1/	0	0	1280	0	0	0
9E	Water Impoundment Sites 1/	1200	1200	1200	1200	1200	1200
10A	Research Natural Areas	1680	1680	1680	1680	1680	1680
10D	Wild and Scenic Rivers	6660	6660	6660	6660	6660	6660
10E	High Lakes Wilderness Study Area	14,700	14,700	14,700	14,700	14,700	14,700
10F	Dunoir Special Management Area	28,800	28,800	28,800	28,800	28,800	28,800

1/ Acres are too small or scattered to be mapped at the planning map scale.
2/ Acre figure includes riparian areas, floodplains, lakes, and nonriparian wetlands.
3/ Acres too scattered and small to be mapped at the planning map scale; mapping of 7E includes some areas of 7C.

TABLE IV-2

Successional Stages of Vegetation by the Year 2030

	Approximate Desired by the Year 2185	Existing	Alternative					
			A Current	B Commodity Emphasis	C Non Commodity Emphasis	D Preferred	E Reduced Budget	F RPA
TENTATIVELY SUITABLE TIMBER (Acres)	-	-	144,682	144,682	144,682	144,682	144,682	144,682
0-20 Years (Percent)	9	21	9	14	8	8	2	8
20-40 Years (Percent)	9	0	9	14	9	8	2	8
40-60 Years (Percent)	9	0	15	16	14	15	10	15
60-80 Years (Percent)	9	0	11	10	10	14	10	10
80-100 Years (Percent)	9	3	0	0	0	0	0	0
100-120 Years (Percent)	9	9	0	0	0	0	0	0
120-140 Years (Percent)	9	0	2	0	1	1	1	2
140+ Years (Percent)	15	45	32	24	36	32	53	35
All Age (Percent)	22	22	22	22	22	22	22	22
OTHER CONIFER (Acres)	-	-	1,156,442	1,156,442	1,156,442	1,156,422	1,156,422	1,156,422
ASPEN (Acres under Periodic Treatment)	-	-	4,500	4,940	4,800	4,500	2,620	4,380
0-20 (%)	25	5	25	25	25	25	25	25
20-40 (%)	25	5	25	25	25	25	25	25
40-60 (%)	25	45	25	25	25	25	25	25
60-80 (%)	25	45	25	25	25	25	25	25
ASPEN (Acres Treatable Remaining Untreated) 1/	-	-	7,800	9,000	7,350	7,800	11,400	9,450
ALPINE (Acres)	199,700	199,700	The acres of Alpine grass/forb community types will remain constant through time and unaffected by the various alternatives.					
SAGEBRUSH/GRASS (Acres)	211,855	211,855	The acres of sagebrush/grass community types will remain constant through time. For a detailed look at changes withinthe sagebrush/grass community type refer to the wildlife and range sections of this chapter.					

1/ Aspen acres not receiving periodic treatment will become decadent, die and be replaced by confiers. Also, natural phenomena such as insects, disease, grazing, fire and animal damage will occur which will place some untreated stands into younger age classes. Prediction of such phenonmena is not attempted here.

optimum for the Forest to provide a sustained yield of wildlife habitat, visual quality, dispersed recreation experiences, wood products and resistance to insects and disease.

A significant part of the vegetation management program on the Shoshone National Forest is accomplished through the commercial timber sales program. Past experience has demonstrated that the timber sales program is an effective method of managing the suited timber lands on the Forest and to meet other resource objectives. On the Shoshone National Forest, land that is tentatively suitable for timber production is only six percent of the forested lands. The bulk of forested lands are too steep, support noncommercial quality timber, or are within designated wilderness. Hence, the vegetation management program attainable through a commercial timber sales program is of relatively small consequence Forest-wide.

Because a relatively small proportion of the Forest is suitable for timber management, other noncommercial practices are included in all alternatives. This includes treating sagebrush, aspen, and willow to provide age distributions favorable for visuals, wildlife, and to provide forage for domestic lovestock. Fire prescriptions have been developed which allow fire to play a major role in providing for diversity of vegetation types and age structures.

Table IV-2 displays current, desired and the probable results of implementing each alternative by the year 2030. The five successional/structural stages indicated in the table relate both to the ages of the stands and their structural condition. Mixed age stands are included on the basis of the average age for the stand. Mixed age stand condition is the most common successional/structural type for the climatic regime within which the Forest occurs. Also, about 90 percent of the forested lands are within wilderness or are not tentatively suitable for timber production. This results in a predominance of old growth forest as noted in the table.

Program Outputs and Environmental Effects

Vegetation management is a tool used to achieve other resource management objectives such as wildlife habitat improvement, increasing water yield, or maintaining or improving water quality. Hence, the consequences of vegetation management are discussed in other resource sections contained in this chapter.

RECREATION

All alternatives emphasize outdoor recreation on a Forest-wide basis. In all alternatives at least forty percent of all nonwilderness acreage is assigned to Management Area Prescriptions which emphasize recreation opportunities. Dispersed recreation opportunities also exist in all management areas emphasizing resources other than recreation (e.g., hunting and four-wheel driving in areas emphasizing timber management). All areas designated as wilderness or wilderness study areas provide opportunities for primitive or semiprimitive nonmotorized recreation experiences.

Table IV-3 illustrates the Forest-wide composition of the available Recreation Opportunity Spectrum (ROS) that will result from implementation of each alternative (see Glossary, Chapter VII, for a discussion of ROS). The Table also shows the existing inventoried ROS composition. The percentages were derived using estimated changes from the existing situation due to the selection of FORPLAN prescriptions for individual analysis areas, including projected road construction.

TABLE IV-3

Nonwilderness Recreation Opportunity Spectrum Class Acres by Alternative (thousand acres)

Alternative	Primitive	Semi-Primitive Nonmotorized	Semi-Primitive Motorized	Roaded Natural	Rural	Urban
Currently Inventoried	21	74	675	263	21	0
A	12	381	354	278	23	0
B	0	521	253	260	11	0
C	5	585	167	284	11	0
D	15	457	319	250	11	0
E	20	556	231	197	22	0
F	12	468	291	272	11	0

The Forest has more than twice the capacity to accommodate the anticipated use in all alternatives. However, the relative mix and location of recreation opportunity classes outside wilderness will change between alternatives. Alternative A provides the current mix of recreation opportunities. Alternatives C and F provide fewer developed recreation opportunities than A, but both significantly increase dispersed, nonwilderness recreation opportunities. Alternative E produces less of each while both Alternatives B and D provide more dispersed and developed recreation than Alternative A.

In terms of recreation quality, Alternative A provides the same quality as is experienced currently. All alternatives provide for meeting minimum quality standards as listed in Forest Direction. The amount above minimum quality standards varies by alternative in direct relationship to budgets. In

Alternative E, some developed sites will be closed as well as some trails so that the minimum standards can be met in areas left open. Alternatives B, D, and F provide for greater access to the Forest so that both developed and dispersed recreation opportunities are more evenly spread across the Forest. This has a tendancy to increase the quality of recreation opportunity by keeping such use at lower densities. Alternative D provides more access on a seasonal basis than any other alternative.

The recreation program also includes visual resource management. The objective of visual resource management is to attain the highest possible visual quality commensurate with other appropriate public uses, costs and benefits. Visual quality objectives (VQO's) are assigned to all areas of the Forest. The measurement system assigned to VQO's includes Preservation, Retention, Partial Retention, Modification and Maximum Modification (See Glossary for definition of these terms.) Retention and Partial Retention are emphasized to ensure that activities are harmonious with the characteristic landscape. The overall landscape characteristics of the Forest will remain the same in all alternatives. The relative quality of the visual resources will generally be improved in all alternatives except E, which will reflect the current situation, but with the risk of reduced visual quality in some areas due to the lowered emphasis on visual rehabilitation and enhancement practices.

Dispersed Recreation

Dispersed recreation is that portion of outdoor recreation use which occurs on all areas of the Forest outside developed recreation sites. Dispersed recreation management in wilderness is discussed in the WILDERNESS section. The dispersed recreation program includes activities such as monitoring the condition and quality of the Forest's recreation opportunity settings, maintenance of trails, trailheads, backcountry campsites, cleanup and disposal of refuse, management of outfitter and guide permits, law enforcement, signing, and providing information to users. These activities are carried out to provide diverse and high quality recreation settings in which to enjoy activities such as hunting, fishing, driving for pleasure, trail biking, four-wheel driving, hiking, cross country skiing, snowmobiling, nature study, firewood gathering, and mountaineering.

Program Outputs

Table IV-4 displays predicted dispersed recreation use and managed capacity in thousands of recreation visitor days (RVD's) for the years 1985 through 2030. Total dispersed recreation use Forest-wide would increase under all alternatives. However, the kinds of recreation activities and the amount of increase would vary in specific areas depending on the alternative selected.

Recreation settings would be managed to provide high quality experience opportunities in all alternatives. Under Alternative E the dispersed recreation use would be expected to continue to increase but the overall quality of the settings and experiences would decline over time due to a reduction in recreation administration.

Area restrictions on dispersed motorized forms of recreation vary slightly by alternative. These restrictions are displayed in Figure IV-1.

TABLE IV-4

Nonwilderness Dispersed Recreation Use and Managed Capacity*
(Average Annual MRVD)

		Nonmotorized Recreation		Motorized Recreation	
Alternative	Planning Period	Managed Capacity	Predicted Use	Managed Capacity	Predicted Use
A (Current)	1	36	17	966	335
	2	75	18	1124	372
	3	92	20	1253	413
	4	117	22	1435	458
	5	150	24	1660	509
B (Commodity)	1	81	17	1110	335
	2	108	18	1208	372
	3	137	20	1331	413
	4	178	22	1673	458
	5	236	24	1711	509
C (Noncommodity)	1	94	17	1139	335
	2	127	18	1267	372
	3	180	20	1398	413
	4	275	22	1749	458
	5	465	24	1802	509
D (Preferred)	1	81	17	1151	335
	2	100	18	1276	372
	3	127	20	1415	413
	4	166	22	1606	458
	5	219	24	1846	509
E (Reduced Budget)	1	51	17	1056	335
	2	62	18	1170	372
	3	75	20	1280	413
	4	95	22	1606	458
	5	121	24	1639	509
F (RPA)	1	77	17	1092	335
	2	102	18	1186	372
	3	127	20	1307	413
	4	163	22	1645	458
	5	213	24	1679	509

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* Does not include Wildlife-related and Fish-related recreation use.

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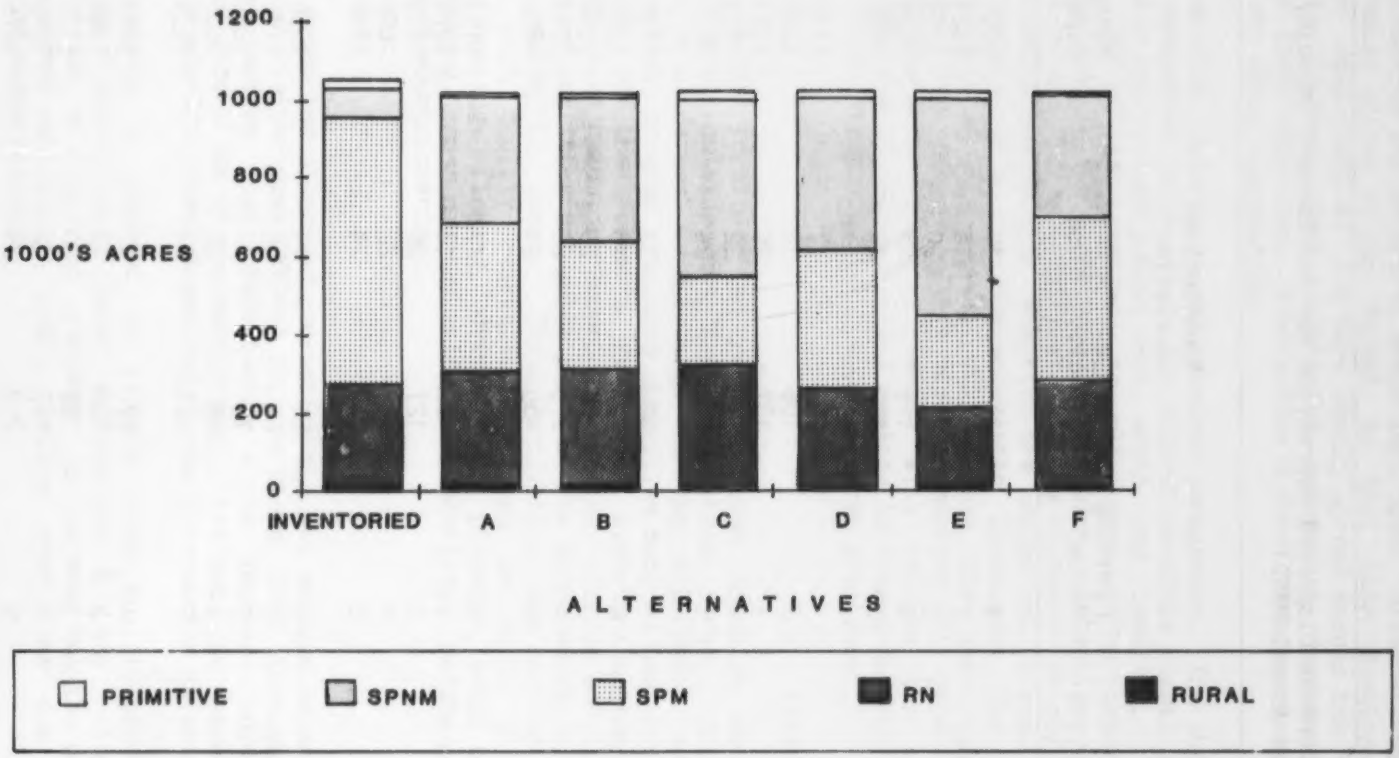
FIGURE IV-1 Nonwilderness ROS Classes



Environmental Effects

On Vegetation - Uncontrolled off-road vehicle use would increase the risk of damage to rangeland forage under all alternatives. In all alternatives, ORV use is restricted to designated travel routes Forest-wide. The risk of damage would be highest under Alternative E where control and contact with ORV users would be substantially lower. The risk would be least under Alternative D where the majority of roads will be controlled using seasonal closures which will restrict access during those periods when resource damage could be the worst.

On Recreation - Recreation opportunities would change under all alternatives as reported in Table IV-3. These opportunities are reflected by the number of acres in the various ROS Classes under each alternative.

On Visual Resources - Dispersed camping along trails, rivers and streams and next to lakes would cause worn areas with a corresponding decrease in visual quality adjacent to the areas. Dispersed camping would increase under all alternatives. The effects of dispersed camping would be mitigated by Forest Direction that prohibits camping within a minimum of 100 feet from lakes and streams and adherance to the standards for dispersed campsites (see Dispersed Recreation Management General Direction in Chapter III of the Plan). Beyond this, Alternatives A, B, D, and F provide for greater dispersion of recreation users, thus lessening the change of overuse in some areas.

The visual quality of areas managed specifically for semiprimitive recreation opportunities would be maintained or enhanced under Alternatives A, B, C, D and F through implementation of Forest Direction that requires managing sites and areas to meet the visual quality objectives of Retention or Partial Retention. (see Visual Resource Management General Direction of the Forest Plan). Under Alternative E, dispersed recreation use and its effects could not be managed as effectively and visual resource degradation would likely occur over time.

TABLE IV-5

Alternative Visual Quality Objectives

Visual Quality Objective		Alternative					
	Inventoried	A	B	C	D	E	F
Preservation	1382	1386	1620	1654	1582	1478	1670
Retention	294	756	530	491	566	736	480
Partial Retention	563	208	201	200	203	137	202
Modification	185	66	64	70	65	71	65
Max. Modification	9	16.8	16.8	16.8	16.8	10.2	16.8

Table IV-5 lists the total acres of each visual quality objective which would be acheived in each alternative through Management Area Prescription allocations. All alternatives would reduce the Modification and Maximum Modification VQO categories by about 140,000 acres. Alternative A would have the largest increase in acreage managed with the VQO of Retention or Partial Retention. Each of the principal travel routes though the Forest will be managed to protect or enhance the foreground and middleground views in all alternatives.

On Cultural Resources - The increased dispersed recreation that would occur under all alternatives would affect cultural resources in two ways. First, increased use would cause a corresponding increase in removal of artifacts and vandalism of cultural resource sites. On the other hand, it is likely that the increase in dispersed recreation would cause an increase in discovery and reporting of previously undiscovered sites. These effects would be in proportion to the increases in dispersed recreation reported in Table IV-4. The cultural resource survey of the Forest will be completed by 1990, except under alternative E. Under that alternative completion would be dependent upon the State of Wyoming or a university working under an agreement with the Forest. The likelihood of vandalism and loss of irreplacable artifacts would be greatest under Alternative E because of reduced funding for cultural resource programs.

On Wilderness - Wilderness recreation use would increase under all alternatives, with a corresponding increase in trail and campsite wear. The effects would be in proportion to the amount and kind of access provided to or near the wilderness boundary. Alternatives A, C, and D provide the largest trail network and by dispersing such use would have the least impact. These effects would be mitigated under all alternatives by Forest Direction that requires management to minimize evidence of man's use of the wilderness. (See Wilderness Area Management General Direction and direction for Management Area 8A, 8B, 8C, and 8E in Chapter III of the Forest Plan.)

Because the threatened grizzly bear exists within some of the wilderness on the Forest, special management actions have been implemented which allow man-made facilities to be installed within wilderness to prevent grizzly bears from being rewarded by obtaining human food, human refuse, horse feed or game meat. The facilities that might be found within widerness at outfitter camps and public camps include bearproof storage containers, meat poles, elevated platforms and portable electric fences.

On Wildlife - Increased dispersed recreation would lead to increased human intrusion in wildlife security areas. A decrease in overall habitat effectiveness for species that require seclusion from human activities would result, and these species would be displaced to other habitat areas. The ensuing competition for these habitats would decrease overall effectiveness of critical habitats such as winter range and migration routes. The magnitude of the effect would correspond by alternative to the increased RVD's reported in Table IV-4, the miles of roads left open for public use (Tables II-5 and II-6), and the location of trails in relation to critical habitats. Alternatives C and D provide standards beyond other alternatives to mitigate some of this impact with the large amount of seasonal road closures in Alternative D having the most significant effect.

Since it is the use of the roads and trails, not the roads and trails themselves, that reduces the effectiveness of suitable habitat, mitigation measures focus on the management of existing and planned roads to control impacts of dispersed recreation. More miles of roads and trails open and used by the public in sensitive habitat areas would result in a corresponding decrease in wildlife habitat effectiveness. Mitigation would be provided under all alternatives by direction for Wildlife Habitat Improvement and Maintenance and Transportation System Management in Chapter III of the Forest Plan.

People gathering firewood disturb animals and decrease overall wildlife habitat effectiveness during the time an area is open for this activity. If snags are removed, a direct reduction in cavity-dependent species habitat would occur. Under all alternatives, Forest Direction provides for a minimum level of habitat for species dependent on snags, dead and down material, and old growth ecosystems. (See Diversity requirements and Wildlife Habitat Improvement and Maintenance General Direction in Chapter III of the Forest Plan.) Firewood gathering would be expected to remain at current levels for all alternatives, but variations in firewood gathering locations would affect wildlife under all alternatives. This effect would be lessened in alternatives such as A, B, D, and F which provide for larger timber harvest and therefore more firewood available in areas not used by wildlife.

The effect of dispersed recreation use on grizzly bears would be the same in all alternatives. Those campsites and trails in or near grizzly habitat areas will remain attractive to the bears unless special precautions are taken by the users. This could be detrimental to both the bears and the users. This effect is mitigated by implementation of the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area". (See Wildlife and Fish Resource Management in Chapter III of the Forest Plan.)

Hunting directly affects the population of game animals. This effect is managed by the Wyoming Game and Fish Department through license sales, bag limits, and season lengths. Hunting also temporarily displaces big game from preferred foraging and rutting areas, so habitat effectiveness is especially important during hunting seasons. Hunting generally would increase by alternative along with increases in winter range carrying capacity for bighorn sheep and elk. Impacts would be mitigated with seasonal and area closures and maintenance of adequate cover. Alternatives B, D, and F provide more vegetation treatment, thereby lessoning this impact on any single location. Of these, Alternative D provides for more seasonal road closures to mitigate impacts on wildlife. (Wildlife and Fish Resource Management General Direction and Wildlife Habitat Improvement and Maintenance requirements in Chapter III of the Forest Plan would apply to all alternatives.)

On Fish - Sediment caused by soil erosion from increased dispersed recreation activities utilizing motor vehicles and pack and riding stock near water courses and lakes would degrade fish habitat. Table IV-4 shows increases in dispersed recreation, and the risk of degradation of fish habitat would correspond to these increases. All alternatives would have the same effect. Because of a reduction in recreation use administration, Alternative E would increase the risk of degraded habitat more than the other alternatives. This problem could be mitigated under all alternatives by riparian area direction that limits vehicular and recreation stock use on roads and trails at times when the ecosystem could be unacceptably damaged. Mitigation could also include seasonal and permanent road and area closures and restrictions on dispersed campsite location and conditions. (See same references as listed under Wildlife. See also Wilderness Riparian Area Management and Water Resource Improvement and Maintenance in Chapter III of the Plan.)

Fishing is a form of dispersed recreation that would directly affect the fish population. The Wyoming Game and Fish Department determines the level of fishing by issuing licenses and setting creel limits.

On Water and Wetlands - Increased trail use and dispersed camping in areas where there are no sanitary facilities would be accompanied by increased human waste and litter. If trails and dispersed campsites are near water features, the risk of reduced water quality is increased. Increased human activities near streams can introduce floating solids (e.g., cans, bottles, refuse) that detract from aesthetics. Human and animal waste deposition near streams has the potential to introduce biologic pollutants such as bacteria, viruses, and protozoa. Man's activity, in association with dogs and various species of wildlife, has been shown to increase the incidence of Giardia (spp.), a protozoa, in natural waters. Public water supplies would be greatly threatened by such an increase (Williams, O.R., 1981). The magnitude of the effect Forest-wide would correspond by alternative to the use figures reported in Table IV-4. Alternatives B, C, and D, which provide more access, will disperse use more and thereby reduce impacts on any single location. Forest Direction that requires protection of riparian areas and water quality would mitigate potential problems under all alternatives except E. Under that alternative the risk of reduced water quality would be higher because of less control and contact with backcountry users.

Uncontrolled motorized recreation in wetland areas creates a profusion of parallel tracks, with loss of vegetation and soil. This condition, if left untreated, can result in a system of gulleys and eventual loss of the wetland itself.

Increased motorized dispersed recreation in the vicinity of water features would increase the risk of erosion and affect water quality. Unimproved stream fords, where trail bike or other ORV use occurs, may represent a direct source of sediment. Sedimentation occurs with passing vehicles, but the greatest potential for sediment delivery is during spring runoff when road or trail snowmelt drainage runs directly into the stream. The risk of cumulative effects is coincident with the amount of area open for motorized recreation (see Table II-6). The greatest risk occurs with Alternative A, the least with Alternative D. Less control and contact with backcountry users is expected under Alternative E, thereby increasing the potential for lowered water quality.

On Minerals and Energy Resources - These resources are generally unaffected by dispersed recreation management. This is the case for Alternatives A, B, E and F. Under Alternative C, the oil and gas program would be subordinate, Forest-wide, to values associated with dispersed recreation, primarily visual quality and wildlife. Under Alternative D, selected areas of the Forest retain an emphasis on surface resources over oil and gas; dispersed recreation values would guide the assignment of more restrictive recommended operating procedures on oil and gas leases.

On Lands - Increased dispersed recreation use would likely increase conflicts between recreationists and other Forest land uses such as livestock grazing, mineral exploration and operation, timber harvest, and different recreation activities. Some livestock would likely be disturbed or displaced by increased recreation use. Hikers who are accompanied by dogs often disturb livestock grazing. These effects would occur in proportion to the dispersed recreation use increases reported in Table IV-4. Conflicts with timber harvesting activities and incompatable recreation activities would be resolved through implementation of the management direction contained in specific prescriptions.

On Soils - Recreational vehicle use of designated four-wheel drive roads, trails and campsites is expected to result in some impacts on the soil resource. Use of such facilities or sites could result in damage to drainage structures which allows erosion to accelerate on road, trail and camping area surfaces. Soil materials deposited off-site can decrease the productivity of these sites. Compaction of dispersed camp sites resulting from trampling and use could lower the productivity. Some soil types, particularly in the Wind River Range, are particularly susceptable to compaction. Unmanaged use could cause long term impacts to soil productivity by accelerating the erosion rate and compacting the soil surface layers.

In general, dispersed recreation would be expected to have a low impact on the soil resource. However, significant impacts such as those mentioned above are expected in concentrated use areas under all alternatives. Alternative D, with its high amount of seasonal road closures, would have the least effect.

On Facilities - Estimating 2.5 persons per vehicle and average length of stay as one visitor day, dispersed motorized recreation use would create 134,000 estimated total-annual-traffic units under all alternatives in the first decade. Maintenance costs and reconstruction needs are assumed to be proportional to traffic units. Compared to the existing situation, all alternatives would cause increased road wear as a result of increased dispersed recreation use over time. Road Maintenance General Direction 12, of Chapter III of the Forest Plan, would mitigate this potential problem under all alternatives, and would be proportional to road maintenance as shown in Table II-5.

Increased predicted use under all alternatives (shown in Table IV-4) would cause increased wear on trails. This is in proportion to dispersion of use indicated by total trail miles shown in Table II-5 and II-6. Further, trail condition will vary by alternative in relation to the amount of money budgeted for trail maintenance. Potential problems would be mitigated under all alternatives except E by maintenance and proper development of new trails. Lower trail maintenance called for in Alternative E would result in degradation of the trail system.

Solid waste deposition would increase in direct proportion to increased use (shown in Table IV-4). The implications of this would be most apparent under Alternative E because greater reliance would have to be placed on volunteers and the users themselves to carry out and properly dispose of solid waste.

On Fire - Increased dispersed recreation use of the Forest would increase the risk of man-caused fires under all alternatives. On the other hand, increased dispersed recreation use would contribute to early detection and, in some cases, suppression of fire. The increase would correspond to the increases in dispersed recreation activity shown in Table IV-4. The increased risk of fire would be mitigated by road closures. While there would be more fire starts, closures and earlier detection would result in fires controlled at smaller acreages. Firewood gathering would reduce fuel loads and continuity resulting in reduced fire intensities and rates of spread. Over time, this would reduce the risk of large, destructive fires.

On Insect and Disease - Continued high levels of firewood gathering under all alternatives could reduce the potential build-up of mountain pine beetle in conifer stands under management.

On Air - Dispersed motorized recreation causes short-term air contamination by vehicle emissions and dust. Levels of potential contamination would vary by alternative according to the managed capacity in RVD's of motorized recreation. For the first decade, this is greatest in Alternative C and least in Alternative A. Based on predicted use, such effects do not change by alternative. The effects would be mitigated under all alternatives by Forest Direction that requires compliance with all state and federal air quality standards. The effects would be temporary in that they would occur only while the activity occurs.

On Noise - Increased dispersed motorized recreation under all alternatives would cause short-term localized increases in noise levels and disruption of solitude in backcountry nonwilderness areas. Chain-saw use associated with firewood gathering (treated as a recreation activity in the analysis) would also cause short-term increases in noise levels. The magnitude of the increases would correspond to the increased use reflected in Table IV-4. These effects would be temporary and site-specific.

Developed Recreation

Developed recreation includes all recreation activities that take place on a developed recreation site. These are relatively small, distinctly defined areas where facilities are provided for concentrated public use (e.g., campgrounds, picnic areas, resorts and ski areas). The developed recreation program includes activities such as maintenance, construction and reconstruction of sites; law enforcement; collection of recreation use fees; providing information; administration of special use permits for downhill ski areas, summer homes, camps and resorts; and interpretation of cultural resource sites. Developed recreation site capacity on the Forest has remained relatively constant since 1980. Projected demand is expected to exceed the 1980 capacity only in Alternative E.

Program Outputs

Table IV-6 displays the managed capacity and predicted use of private sector and public developed recreation sites within the Forest. The private sector includes private recreation residences, organized camps, and resorts operated under special use permit. Outputs would not vary by alternative for this type of development (see table II-5). Use of private recreation residences is expected to increase as winter activities become more popular. However, the Forest Service will not issue special use permits for new recreation residences on the Forest. The Forest has two downhill ski areas, one of which operates only in the spring and summer for a racing camp. There are no known potential ski areas on the Forest.

Alternative E would cause the permanent closure of several public developed recreation sites, and reduce the managed season for all others. This effect is reflected in the figures shown in Tabls IV-6 and II-5.

Under all alternatives, cultural resources would be identified and protected in compliance with laws and regulations. For all alternatives except E, suitable cultural properties would be developed and managed to emphasize the following key themes: Forest Service management, livestock grazing, logging/tie-hacking, commercial resorts and mining. Under Alternative E, no cultural properties would be developed.

TABLE IV-6

Developed Recreation Managed Capacity and Use (Average Annual MRVD, includes Public and Private Sectors, does not include downhill skiing).

Alternative	Managed Capacity	Predicted Use
A	422	404
B	443	404
C	413	404
D	436	404
E	386	404
F	426	404

Environmental Effects

On Vegetation - Intensive silvicultural practices would occur in developed sites under all alternatives to protect vegetation from insects and disease, to increase and perpetuate healthy vegetation and to establish desired vegetative cover. This would be done to a greater extent in Alternatives B and D and to a lesser extent in Alternatives C and E. Such actions generally enhance the appearance and viability of the vegetative cover in and adjacent to the developed sites.

Ski area maintenence or expansion would require that trees be removed from ski run locations. This effect would occur under all alternatives. The impact would be mitigated through on-site supervision of the programs.

On Visual Resources - Developed recreation site maintainence and reconstruction would be designed, under all alternatives, to blend with the characteristic landscape and meet the adopted visual management objectives for the management area in which they are located. Snowmobile parking lots and downhill ski areas would affect visual resources more than other developments. Snowmobile parking lots require relatively large openings adjacent to primary roads, and these openings would affect the road-side visual resource year-round. The demand for more snowmobile parking lots would be expected to increase under all alternatives, but the visual effects will be minimized by using opening designs that blend with the characteristic landscape and meet the visual quality objective for the area. (See Visual Resource Management in Chapter III of the Forest Plan.)

Downhill ski areas, with ski run patterns perpendicular to mountain slopes, would affect visual quality under all alternatives. Although facilities may dominate, Forest Direction requires that they harmonize and blend with the natural setting and meet the visual quality objective for the area. (See Visual Resource Management in Chapter III of the Forest Plan.)

On Cultural Resources - Development of new sites would create the chance of destroying undiscovered sites and artifacts. Performing preconstruction site surveys as directed in the Plan will mitigate this risk.

On Wilderness - Developed recreation sites near wilderness access points tend to concentrate dispersed recreation use within wilderness at those points and decrease the opportunities for solitude. These effects would be mitigated under all alternatives by Forest Direction that requires management to minimize evidence of human use of the wilderness (see Wilderness Area Management General Direction and Wilderness Management prescriptions 8A, 8B, 8C, and 8E of the Forest Plan). Where feasible, developed sites will be located sufficient distances from wilderness to effectively reduce their impact on opportunities for solitude within the wilderness. Alternatives A, C, and D provide for more dispersed recreation facilities and will thereby disperse use more than other alternatives.

On Wildlife - The effect of developed recreation site use on wildlife in general would be minimal in all alternatives. Those sites in or near grizzly habitat will remain attractive to the bears. This could be detrimental to both the bears and the users. This effect will be mitigated as directed in "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area". (See Wildlife and Fish Resource Management in Chapter III of the Forest Plan.)

On Fish - The use of developed sites near streams or lakes concentrates fishing pressure, decreases fishing success and reduces riparian vegetation by trampling. Increased fishing pressure may be beneficial to some brook trout populations which are stunted due to overpopulation. These effects would occur under all alternatives in proportion to the increase in use (Table IV-6). Potential problems would be mitigated under all alternatives by implementation of Forest Direction that requires protection of riparian areas and fish habitat. (See Wildlife and Fish Resource Management and Riparian Area Management in Chapter III of the Forest Plan.)

Ski area expansion would affect fish habitat by increasing the risk of sedimentation. Potential problems would be mitigated under all alternatives by implementation of Forest Direction riparian area protection standards. (See Riparian Area Management in Chapter III of the Forest Plan.)

On Water and Wetlands - The risk of local water quality degradation from summer homes and lodges is great. The narrowness of valley bottoms in which many of these are situated dictates particular care in the design and placement of sewage and wastewater facilities, and corrals for transportation livestock. In many cases, existing facilities are too close to streams and are affecting surface and subsurface water quality. Also, vehicle use, livestock use and foot traffic in the confined valley bottom areas in and about lodges compacts and significantly reduces vegetation ground cover on stream banks and throughout adjoining riparian areas. This increases susceptibility to flooding and decreases water quality. Increased human activities at developed sites near streams can introduce floating solids (e.g., cans, bottles, refuse) that detract from aesthetics. Human and animal waste from developements near streams has the potential to introduce biologic pollutants such as bacteria, viruses, and protozoa. Man's activity, in association with dogs and various species of wildlife, has been shown to increase the incidence of Giardia (spp.), a protozoa, in natural waters. Public water supplies would be greatly threatened by such an increase (Williams, O.R., 1981).

Riparian quality loss also occurs in and about the developed public campgrounds and picnic areas on the Forest due to soil compaction from trailing along streambanks. All such potential effects vary little by alternative, because the number and location of summer homes, lodges, campgrounds and other developed sites does not change significantly. The greatest risk of cumulative effects from these sources is under Alternative E, in which levels of administration and monitoring can realistically be expected to decrease.

Implementation of Forest Direction and Management Area standards and guidelines for all alternatives would mitigate these potential effects. Implementation would necessitate the relocation, redesign or removal of livestock and sewage facilities at some developed sites.

On Lands - Impacts on other land uses would not be significantly different than those currently experienced. During periods of heavy demand along the access routes to Yellowstone National Park, the risk of users trespassing on private lands or camping outside developed sites will increase. This will be mitigated in all alternatives through the use of visitor contact and patrol during these periods.

On Soils - Through maintenance and proper site selection and design to accommodate predicted use levels, soil erosion would remain within tolerance levels. (See Soil Resource Management in Chapter III of the Forest Plan.)

On Facilities - Road use would increase or decrease in proportion to developed recreation use reflected in Table IV-6, and increased use would result in increased wear on roads. A corresponding increase in maintenance would occur. Under Alternative E some sites would be closed, and much of the traffic to those sites would be eliminated.

Solid and sanitary waste would increase or decrease in proportion to developed recreation use shown in Table IV-6, and increased use would require increased collection and disposal under all alternatives except E. The closure of developed sites under Alternative E would eliminate the need for collection and disposal from those sites.

On Fire - The potential for man-caused wildfire problems would be mitigated under all alternatives by Forest Direction that requires presuppression and suppression action. (See Fire Planning and Suppression and Escaped Fires Suppression in Chapter III of the Forest Plan.)

On Air - Air quality would be temporarily lowered during use of developed recreation sites by vehicle emissions, dust, and smoke from campfires. This effect would increase under all alternatives and in proportion to the increase in use shown in Table IV-6. These effects are short-term and occur only during use, so no specific mitigation would be necessary.

On Minerals and Energy Resources - Developed sites are withdrawn from mineral entry and thus allocation of an area to a developed site precludes mineral or energy resource development.

On Noise - The effect of increased developed recreation on noise would be similar to its effect on air quality. During use or construction, noise levels would increase. This effect would be temporary and confined to times when use is actually occurring. Mitigation measures would be to restrict noise to acceptable levels during night time hours and to prohibit excessively noisy vehicles or machinery during periods of visitor use.

WILDERNESS

The wilderness program includes management of the various activities which are permitted in designated wildernesses. These activities include grazing, scientific studies, primitive recreation, grizzly bear habitat management, specially authorized projects (such as rehabilitation), providing information regarding the use of wilderness and the monitoring of the effects of human use on natural ecosystems.

Program Outputs

The Shoshone National Forest contains five designated wildernesses. These include a portion of the Absaroka-Beartooth (23,750 acres), the Fitzpatrick (198,838 acres), North Absaroka (350,488 acres), Popo Agie (101,991 acres) and the Washakie (704,529 acres), for a total of 1,379,596 acres (gross Forest acres). In addition the Wyoming Wilderness Act of 1984 established the High Lakes Wilderness Study Area (14,200 acres) and directed that the Dunoir Management Area be managed to protect its wilderness character. The wilderness acreage for all areas remains constant under all alternatives.

Under all alternatives, wilderness resources would be protected as directed legislatively and described in Forest Direction and direction for Management Areas 8A, 8B, 8C, and 8E in Chapter III of the Forest Plan. If recreation use exceeds capacities established for any specific Management Area within a wilderness, management actions to reduce unacceptable use levels could consist of road (wilderness access) and trail restrictions or closures, permit systems, or other management actions to keep use at acceptable levels. Alternatives A, C, and D provide for more trails and therefore more dispersion of users. Out of these three, Alternative D provides the most access to wilderness areas, thereby contributing more to a dispersion of users. Thus the risk of degradation of sites and trails is least under Alternative D.

TABLE IV-7

Wilderness Use and Managed Capacity (Average Annual MRVD)

Alternative	Planning Period	Pristine Managed Capacity	Pristine Predicted Use	Primitive Managed Capacity	Primitive Predicted Use	Semiprimitive Managed Capacity	Semiprimitive Predicted Use
A (Current)	1	3.93	2.00	34.9	4.04	167.	138.
	2	4.11	2.22	46.9	4.48	212.	153.
	3	4.71	2.46	64.0	4.97	281.	169.
	4	5.46	2.73	88.3	5.52	386.	188.
	5	6.26	3.03	123.	6.13	550.	209.
B (Commodity)	1	4.25	2.00	34.5	4.04	161.	138.
	2	4.63	2.22	46.2	4.48	204.	153.
	3	5.26	2.46	70.0	4.97	267.	169.
	4	6.06	2.73	86.8	5.52	364.	180.
	5	6.91	3.03	121.	6.13	513.	209.
C (Noncommodity)	1	3.15	2.00	34.2	4.04	193.	138.
	2	3.27	2.22	45.6	4.48	241.	153.
	3	3.77	2.46	61.8	4.97	312.	169.
	4	4.37	2.73	84.8	5.52	423.	180.
	5	5.11	3.03	118.	6.13	590.	209.
D (Preferred)	1	4.19	2.00	35.7	4.04	156.	138.
	2	4.41	2.22	47.8	4.48	189.	153.
	3	5.05	2.46	65.0	4.97	237.	169.
	4	5.80	2.73	89.4	5.52	280.	180.
	5	6.61	3.03	124.	6.13	409.	209.
E (Reduced Budget)	1	2.86	2.00	16.0	4.04	120.	138.
	2	3.02	2.22	21.5	4.48	153.	153.
	3	3.49	2.46	29.6	4.97	202.	169.
	4	3.94	2.73	41.5	5.52	279.	180.
	5	4.67	3.03	59.5	6.13	391.	209.
F (RPA)	1	4.25	2.00	33.0	4.04	182.	138.
	2	4.62	2.22	44.3	4.48	228.	153.
	3	5.26	2.46	60.6	4.97	295.	169.
	4	6.05	2.73	83.7	5.52	399.	180.
	5	6.91	3.03	117.	6.13	552.	209.

Anticipated recreation use of wilderness is shown in Table IV-7. On the Shoshone National Forest, designated wilderness is categorized into three opportunity classes: semiprimitive, primitive and pristine. The direction for Management Areas in Chapter III of the Forest Plan outlines the management intent within the three recreation opportunity classes.

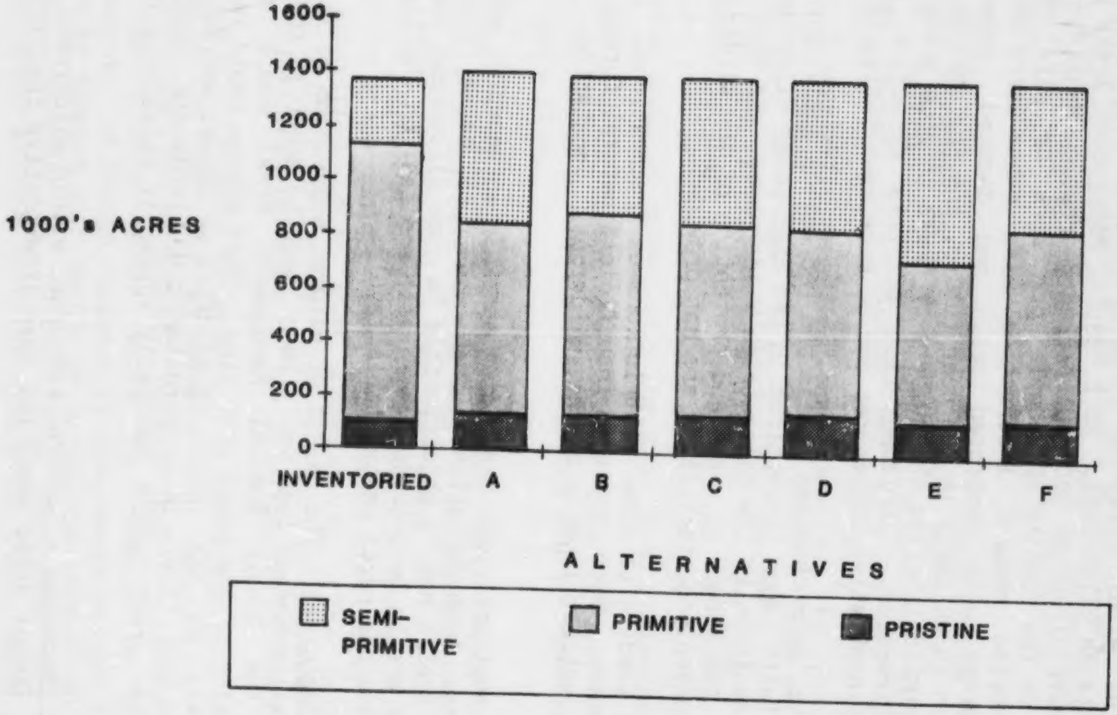
The wilderness recreation opportunity spectrum composition for all wildernesses by alternative is shown in Table IV-8. Alternative A represents the mix that would occur following current plans and programs. Alternative D shifts from that mix toward more of both primitive and pristine opportunities. Alternative B produces the greatest total or primitive and pristine recreation opportunities. Alternatives C, E, and F move in the opposite direction to produce less pristine and primitive and more semiprimitive. This shift will tend to concentrate users more and increase use of wilderness areas. Alternative E represents the probable effect of long-term wilderness management with a reduced budget; primitive opportunities would be reduced to semiprimitive due to less control of wilderness access and less contact with users. Figure IV-2 provides a graphic comparison of wilderness ROS by alternative.

TABLE IV-8

Wilderness Recreation Opportunity Spectrum Class Acres by Alternative (Thousand Acres)

Alternative	Pristine	Primitive	Semiprimitive
Currently Inventoried	110.3	1020.5	248.2
A	146	735	501
B	139	769	472
C	135	710	535
D	159	740	482
E	139	565	677
F	151	658	572

FIGURE IV-2 Wilderness ROS Classes



Environmental Effects

On Vegetation - Under all alternatives, vegetation would respond to natural succession processes. Vegetation treatment is excluded from wilderness and the High Lakes and Dunoir areas, with the exception of the Whiskey Mountain area in the Fitzpartick Wilderness where it is allowed to support the habitat requirements of bighorn sheep. Lodgepole pine stands would slowly be replaced by more tolerant spruce/fir as succession reaches climax in wildernesses and in the special areas, until a major event such as fire or insect epidemics sets back succession. (See effects on Fire).

On Recreation - While recreational use of wilderness is encouraged and expected the principal emphasis of wilderness management direction is to minimize the evidence of human use and provide outstanding opportunities for solitude and primitive recreation. To accomplish this task requires certain restrictions on recreational use within wilderness that are not necessarily needed for the same activities outside wilderness. As a result, Management Areas 8A, 8B, 8C, 8E, 10E and 10F have direction under Dispersed Recreation Management for management of campsites or the density of people per acre or mile of trail. These standards provide reduced interaction with other users and will reduce the number of areas with compacted soils and damaged vegetation. Though implementation is unlikely in the near future, the designation of campsites and the use of permits limiting the numbers of users in some areas are provided for in Forest Direction. Implementation of this direction will require more intensive administrative procedures and be more restrictive on users.

Only primitive, nonmechanized access and recreation activities are permitted in wilderness (with some exceptions in the High Lakes Wilderness Study area and the Glacier Addition to the Fitzpatrick Wilderness), and only those facilities required for the safety of users and protection of the wilderness resources are provided. Convenience facilities are not provided.

Supplemental feeding or other restrictions on recreational livestock grazing are implemented where there is insufficient natural forage available for use without unacceptable impacts on the wilderness vegetation, soil, and water resources.

Use of recreational pack and riding stock is an accepted and traditional form of wilderness transportation. Such use does cause significant wear on wilderness trails and is objectionable to some wilderness users. Restrictions on stock use are to be provided where wear and tear on the trail system and the adjacent resources reach unacceptable levels.

On Visual Resources - The result of natural succession as it occurs within the designated wildernesses (and would be allowed to occur in the High Lakes Study Area and the Dunoir Special Management Area) would change the visual characteristics of the areas over time. This change could be slow, or it could occur quickly as the result of wildfire or insect and disease attacks. The result would most likely be a characteristic landscape mosaic representative of how the areas would naturally appear if relatively unaffected by human activity.

On Cultural Resources - Cultural resources within wilderness and in the High Lakes and Dunoir areas would not have interpretive facilities, nor would they be restored or enhanced for recreation purposes under any alternative. (See Wilderness Area Management General Direction 1 in Chapter III of the Forest Plan).

On Wilderness - Resources within designated wildernesses and the High Lakes and Dunoir areas are protected from the effects of nonwilderness management activities. The effects of human use of the wildernesses and special areas are mitigated by direction provided in the Plan. (See Wilderness Area Management direction and direction for Management Areas 8A, 8B, 8C, and 8C in Chapter III of the Forest Plan.)

Increased wilderness use would result in increased solid waste accumulation under all alternatives in proportion to increased use as shown in Table IV-4. Wilderness management in accordance with the standards and guidelines in the Forest Plan would be adequate to control indiscriminate disposal and accumulation of solid waste in these areas in all alternatives. Alternative E would have the greatest risk of not being able to acceptably mitigate the problem over an extended time period due to reduced budgets. Alternative D would have the least risk.

On Wildlife - Vegetation and habitat diversity would change in response to natural successional processes in areas managed for wilderness, and wildlife populations would respond to those changes. Wilderness management would increase big game habitat effectiveness and security for those species sensitive to moderate or high levels of human activity (such as the grizzly bear). Exclusion of vegetation management would continue to provide habitat for old growth and cavity dependent species until a major event sets back succession (see effects on Fire). Vegetation management in the Whiskey Mountain portion of the Fitzpatrick Wilderness is permitted to support the habitat requirements of bighorn sheep. Increased use of wilderness trails would increase the risk of displacing some sensitive species to more secluded areas. These effects would be essentially the same in all alternatives.

On Fish - The effect on fish populations, in all alternatives, would be in proportion to the increased use of the wildernesses and the special management areas as shown in Table IV-4.

On Threatened and Endangered Species - Management of large tracts of wilderness should provide stable or improved habitat conditions for the grizzly bear and other T&E species requiring isolated areas for some activities. Increased human use of trails, areas of mineral concentrations, backcountry camps, and high forage production areas would present significant challenges for grizzly bear management activities under some alternatives. The Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area would provide management direction regardless of the alternative implemented.

On Range - Grazing of livestock is permitted within wilderness where grazing use was established at the time the wilderness was designated. Structural range improvements may be permitted, except under pristine wilderness management, with restrictions which reduce the impacts on the natural wilderness environment. Although allowed by law, areas managed for pristine wilderness will not be stocked with cattle or sheep, but recreation horse use will be permitted. Appendix J, Forest Plan, describes the areas where permitted cattle and sheep grazing in wilderness would occur under Alternative D.

On Water and Wetlands - The State of Wyoming declares wilderness streams as Class I, subject to quality standards generally higher than those of other Wyoming waters. Wilderness designation has a significant beneficial effect on water quality and watershed conditon in general. A number of activities that could affect water values are precluded, the major ones being road construction and road-related uses. Due to higher standards for wilderness water quality, and due to physiography and fragility of ecosystems in which many impacts may be concentrated, wilderness uses can have adverse impacts on the water resource.

Recreation use of wilderness concentrates in or near wetlands associated with lakes and perennial streams. Along major streams in the narrow valleys which prevail in wilderness, there are few suitable campsites. Such areas coincide with sites used by outfitters and guides and other groups that depend upon transportation livestock. Domestic livestock use also concentrates in these areas (in wilderness grazing allotments) which represents a source of water and forage. At times during the year, wildlife depend upon forage that is available in riparian zones. The attraction of these areas for all such uses relates to their biologic productivity and variety, associated with the presence of water. Potential cumulative effects of managing wilderness includes riparian or wetland degradation and lowered water quality due to physical, chemical or biologic pollutants. Increased human activities near streams can introduce floating solids (e.g., cans, bottles, refuse) that detract from aesthetics. Human and animal waste deposition near streams has the potential to introduce biologic pollutants such as bacteria, viruses, and protozoa. Man's activity, in association with dogs and various species of wildlife, has been shown to increase the incidence of Giardia (spp.), a protozoa, in natural waters. Public water supplies would be greatly threatened by such an increase (Williams, O.R., 1981). Resultant water quality could be lower than the Class I state standards permit. The risk of such a consequence increases as more livestock are permitted and more recreation use (both commercial and noncommercial) occurs. This would be the case in Alternatives A, B and F. The least apparent risk lies with Alternative E due to lowered levels of permitted livestock. All alternatives are subject to General Direction under Riparian Area Managment and Wilderness Area Management in Chapter III, Plan.

Water storage or diversion projects are not prohibited in wilderness, but Presidential approval is required to implement such projects.

On Minerals - The designated wildernesses are withdrawn from mineral entry and leasing in all alternatives. The High Lakes Study Area and the Dunior Special Management Area are available for mineral entry and leasing but have restrictions on surface occupancy which would alter their wilderness eligibility characteristics. This occurs under all alternatives until a Congressional decision regarding their final classification is made.

On Lands - Management as wilderness would eliminate the granting of new land use permits for nonwilderness activities and projects in the study areas. Range improvements existing at the time of formal designation and those deemed necessary for the continuation of grazing activities would be allowed in accordance with the Wilderness Area Management direction and direction for Management Areas 8A, 8B, 8C and 8E in Chapter III of the Forest Plan.

In the High Lakes Study Area and Dunoir Special Management Area the land use activities currently allowed would be continued until there is a Congressional decision on their final classification and management (See Management Areas 10E and 10F in Chapter III of the Plan.)

On Soils - Predicted increased use of wilderness would cause some increased erosion on trails and at campsites under all alternatives. The risk of this effect would occur in proportion to the increased use indicated in Table IV-4. The potential problem would be mitigated under all alternatives by proper trail design and timely maintenance and by implementing the Wilderness Area Management General Direction in Chapter III of the Forest Plan.

On Utility Corridors - Wilderness designation and management of the High Lakes and Dunior areas would restrict the location opportunities and distribution of utility corridors across the Forest. Secretary of Agriculture approval is required to locate a corridor in a designated wilderness. Therefore, utility corridors would most likely be located across nonwilderness portions of the Forest. The effect of this situation will remain the same under all alternatives.

On Fire - Because timber harvest activities are not allowed in designated wildernesses and in the High Lakes and Dunoir areas, standing vegetation would mature and die, increasing fuel loads and the potential for wildfire. Fire dependent ecosystems would be maintained in designated wildernesses by allowing fires to burn under carefully monitored conditions. This would slow vegetation succession and maintain species diversity by promoting intolerant tree species such as lodgepole pine and aspen. This condition would occur under all alternatives.

On Insect and Disease - In all alternatives tree stands in designated wildernesses and in the High Lakes and Dunior study areas would age past maturity and provide an environment for potential insect and disease buildup. Mistletoe will continue to spread if the infected trees are not treated. Although trees become less susceptible to mountain pine beetle as they grow to maturity, the presence of the beetle still provides a source for potential outbreaks. If insect and disease occurances build up within protected areas they could threaten vegetation on adjacent lands. If insect populations approach epidemic proportions adjacent to nonwilderness areas, a biological evaluation and economic analysis (FSM 3430) would be made to assist in determining if suppression is feasible and timely. Suppression action could be taken if warranted. (See Wilderness Area Management General Direction 18 in Chapter III the Forest Plan.)

On Air - The wilderness management program will not affect Class I air quality in wilderness. Air quality in wilderness may be affected by management outside of wilderness or by sources of ambient air pollutants off the Forest. Such effects are discussed through the other resource program consequences. Minerals and minerals related activities hold the greatest potential for significant impacts on wilderness air quality. Air quality related values would be protected in all designated wildernesses and the High Lakes and Dunoir special management areas by implementation of Forest Service Manual Direction (FSM 2120).

On Noise - The continued prohibition of motorized activities in designated wildernesses would maintain the current low noise levels in these areas and continue to provide opportunities for solitude under all alternatives. Some limited motorized activities are permitted in study areas, pending congressional action on final classification.

FISH AND WILDLIFE

The fish and wildlife program includes activities such as designing habitat improvement, timber sales, recreation developments, oil and gas activities, roads and grazing allotment permits to protect or benefit fish and wildlife including T&E species. Management of vegetation types for wildlife will be emphasized in areas needing better quality and quantity of forage and vegetation diversity. This is accomplished in many cases by altering areas of single vegetation species types or successional stages. Wildlife habitat improvement is attained through: aspen regeneration; riparian habitat enhancement through management fencing and prescribed burning; sagebrush treatment by prescribed burning or mechanical means; initiating livestock management systems that benefit wildlife; and surveys and monitoring of populations and coordination with the Wyoming Game and Fish Department and other wildlife cooperators. These practices are specifically designed to improve habitats for certain management indicator wildlife species or groups of species which are identified and discussed in Chapter III.

In addition to the habitat improvement practices listed above, wildlife habitat manipulation and improvement is generated by timber sale activities. Wildlife habitat improvement in forested areas stems from mature stands of timber becoming openings. When the size and juxtaposition of new openings is properly controlled, wildlife habitat is improved. This improvement is due to increasing the edge effect and vegetation diversity, both of which are lacking in the intermediate and late successional stages which are currently predominant. The standards and guidelines contained in Chapter III of the Plan specify the manner in which timber harvest is to occur in all alternatives. These standards and guidelines include criteria relating to size and juxtaposition. In addition, these factors were built into the FORPLAN model used to generate the timber harvest schedule. Alternatives A, B, and F are less sensitive to wildlife in the design of harvest units. In Alternatives C and D, wildlife is a prime consideration in design of harvest units. Alternative E emphasizes silvicultural needs similiar to those in A, B and F, but timber harvesting for any purpose is much lower due to constrained budgets.

Structures built to improve wildlife habitat include water developments, nesting structures, brush piles and snag creation. Of the two types of habitat management (structural and nonstructural), nonstructural methods afford greater opportunities for maintaining and improving wildlife habitats on the Forest.

Big game winter range is the limiting factor on the size of elk and bighorn sheep herds on the Forest. Therefore, emphasis for improving acres of wildlife habitat is placed on maintaining and improving carrying capacity on winter ranges to some degree in all alternatives.

Alternatives A, B, E and F include restrictions on oil and gas activities which protect soil, water, and T&E species only. Alternatives C and D include restrictions to protect soil, water, T&E species, and other wildlife (see MINERALS section of this chapter).

Alternative D provides the highest number of road miles over the planning horizon that are controlled seasonally, protecting wildlife values. The sum of miles closed and controlled is similar in Alternatives A, B, C and D. This sum is lowest in Alternative E because of fewer total roads, and low in Alternative F because of the higher emphasis on open roads.

The fisheries program for the Forest includes monitoring of stream, lake and reservoir habitat to maintain the high quality of the existing fisheries and to provide for incorporation of Wyoming Game and Fish Department programs such as stocking of barren lakes and continued stocking of lakes and streams under their existing program. Standards and guidelines for maintenance and protection of fisheries are incorporated into the Management Area Prescriptions and in Forest Direction for other forest resource management activities such as livestock grazing, timber harvest, roads, minerals and water developments.

One of the main objectives of fish and wildlife management is to provide wildlife-related recreation opportunities. These opportunities depend on viable populations to support big game hunting, small game and upland bird hunting, fishing, and various forms of nongame use.

Program Outputs

Table IV-9 displays the acres of wildlife habitat directly improved by nonstructural means by planning period for all alternatives. The acres of forested land treated by each harvest method in each alternative is shown in the timber section of this chapter in Table IV-20.

Treatment of sagebrush for improving domestic livestock range (between 42 and 300 acres per year during the first decade, depending on alternative) will also improve habitat diversity and provide increased capacities for wildlife. Treatment of sagebrush for cattle in a prescription that provides for a percentage cut for wildlife in suitable rangeland will provide for that percentage of increased forage being available for wildlife. These acres are also not shown in Table IV-9.

All forage in crucial preferred winter range (CPWR) is allocated to wildlife in all alternatives. In addition, each alternative provides for a specified amount of suitable domestic livestock range capacity outside of CPWR to be reserved for wildlife. Table IV-10 displays the total amount of forage provided for wildlife by alternative by planning period expressed in cattle animal unit months. For example, one cattle AUM is equivalent to two elk AUMs or four deer AUMs or five bighorn sheep AUMs. (A Guide for Determining Forage Requirements - SCS publication). All of the alternatives maintain or increase big game winter range capacity.

TABLE IV-9

Acres of Wildlife Habitat Directly Improved by Nonstructural Treatment

		Average Annual Acres				
Alternative	Type	Planning Period				
		1	2	3	4	5
A	Aspen	139	200	89	22	0
	Sage	264	200	295	207	322
	Willow	18	45	18	45	18
	Total	421	445	402	274	350
B	Aspen	167	203	104	19	0
	Sage	338	284	377	298	402
	Willow	18	45	18	45	18
	Total	523	532	499	362	420
C	Aspen	189	200	124	13	0
	Sage	323	298	400	305	427
	Willow	6	13	6	13	6
	Total	518	511	530	331	433
D	Aspen	145	190	95	22	0
	Sage	390	243	410	258	437
	Willow	18	45	18	45	18
	Total	553	478	523	325	455
E	Aspen	119	95	48	0	0
	Sage	189	201	262	210	262
	Willow	0	0	0	0	0
	Total	308	296	310	210	262
F	Aspen	156	174	100	8	0
	Sage	325	251	364	265	390
	Willow	18	45	18	45	18
	Total	499	467	492	318	408

TABLE IV-10

Wildlife Forage Reserved for Wildlife from Suitable Livestock Range Expressed in Cattle Animal Unit Months (CAUMs)

Alternative	Average Annual CAUMS for Wildlife in Thousands Planning Period 1	2	3	4	5
A	42.1	41.9	53.3	55.6	55.6
B	47.2	47.1	59.3	61.7	61.7
C	71.9	71.1	90.6	93.6	93.6
D	42.8	42.7	53.9	56.2	56.2
E	98.5	98.6	130.	136.	136.
F	44.6	44.4	55.8	58.0	58.0

Threatened or Endangered Species

There is known seasonal and yearlong use of the Forest by federally listed threatened and endangered (T&E) species (grizzly bear, bald eagle). Potentially suitable habitat also exists, or may exist, for other endangered species (Northern Rocky Mountain wolf, peregrine falcon, black-footed ferret). However, existing data is insufficient to indicate the Forest is currently occupied by any of these species. A few scattered reports (mostly unverified) of sightings have been recorded for wolves and falcons in past years, and potential nesting sites for the peregrine have been identified. The only known population of black-footed ferrets occurs three to five miles from the Forest boundary.

It is probable that reintroduction would be necessary for recovery efforts associated with the peregrine, ferret or wolf. Thus all alternatives were constructed with the philosophy of maintaining known or suitable habitat for each of these species in case reintroductions become a feasible management option in the future.

Sites believed to have high potential for peregrine nesting were designated as Management Area 4B for all alternatives unless they occurred inside designated wilderness. The emphasis for this prescription is for all T&E species where populations or suitable habitat occurs. Known bald eagle wintering sites or areas used frequently during migration were also included. Maintenance of big game crucial preferred winter range acres and population numbers of big game (potential wolf prey base) will remain constant or increase slightly for all alternatives. If black-footed ferrets are found on the Forest, the area would be reclassified as prescription 4B, if necessary to insure adequate protection. Similar action would be taken for prairie dog towns thought to have high potential as ferret habitat.

Management activities for grizzly bears will be as directed in "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area" irrespective of the chosen alternative. The number of acres which have been stratified into the various grizzly management situations will not change as a result of implementing any particular alternative. However, as a result of recent language in the FY 1985 Senate appropriations bill (Sec. 316), public review of the above document will soon be requested. The language in the above section of the bill states "that the Secretaries of Interior and Agriculture shall provide for a public meeting at each affected National Forest and National Park Headquarters and the subsequent publication of the Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area in the Federal Register, reflecting the public comments". Thus, some subsequent changes in the document could be made. In addition to this uncertainty, the formulated alternatives vary somewhat in the timing of achieving a recovered population of grizzly bears. Accelerated recovery varies with the amount of Management Area 4F (grizzly bear enhancement) applied by alternative (see Table IV-11).

TABLE IV-11

Acres of Grizzly Habitat Enhancements by Alternative

Alternative	Acres of Enhancement (Management Area 4F)
A	0
B	155,903
C	12,974
D	0
E	0
F	81,260

Although all alternatives have a common basis for grizzly bear management, the risks associated with human activities, potential grizzly bear mortalities, and habitat security appear greatest in Alternative B and least in Alternatives C and E. This is true for Alternative E since many human disturbances associated with commodity outputs would be reduced. However, a reduced budget could also mean a reduced capability for involvement in T&E species and habitat management. Alternatives A and D appear to be somewhat similar in potential effects although increased human recreational activities associated with Alternative D could result in a slight increased potential for grizzly human conflicts, and a further deterioration of habitat security.

The Forest Service, under any alternative, will not knowingly authorize, fund, or carry out activities that would jeopardize the continued existence of federally classified T&E species or result in the destruction or adverse modification of legally designated critical habitat for such species.

In accordance with Section 7 of the Endangered Species Act (P.L. 97-304), as amended, the Interagency Cooperation Regulations (50 CFR 402, 43 FR 870), and FSM 2672.42, a biological evaluation for the proposed action (Alternative D) was undertaken. A determination was made that activities associated with the Alternative D may affect the grizzly bear. Thus, formal consultation was initiated with the U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service has rendered a "no-jeopardy" opinion on the Forest Plan (Alternative D). However, it will still be necessary for the Forest to review proposed project actions on a case-by-case basis to determine the degree to which such actions may affect listed species. A copy of the results of consultation with the U.S. Fish and Wildlife Service is included in Appendix H of the Plan.

Environmental Effects

On Vegetation - Trees would be harvested by clearcutting or group selection methods to create permanent or temporary openings to enhance wildlife habitat diversity. Sagebrush would be treated to create a mosaic of age classes to maximize the edge and diversity values on treated acres. Treatable aspen acres would be managed on rotation to provide an even flow of age classes and structural stages. Willow is managed according to individual stand needs based on decadence and amount of use. The acreage total treated in all vegetation types is insignificant and will not effect the vegetation make-up of the whole forest. Vegetation diversity is a common goal of both the wildlife and fish and vegetation programs. Hence, the overall impact of the fish and wildlife program is expected to be positive for all alternatives.

On Recreation - The fish and wildlife program provides a variety of opportunities to benefit and enhance the recreation resources and use of the Forest. Practices that increase the amount, composition, and diversity of the overall wildlife habitats also benefit the recreation opportunities and visual settings. Much of the recreation use of the Forest is dependent on or enhanced by the presence of wildlife and fish species, both for consumption by users and for viewing.

Some of the restrictions necessary for providing effective wildlife habitat or for the protection and enhancement of the T&E species restrict the freedom of recreation users, but the overall effect is one of enhancing the recreational experience.

On Visual Resources - The vegetative treatment practices that increase the amount, composition and diversity of wildlife habitat are also necessary to maintain characteristic landscapes in some areas of the Forest. Some wildlife or fish habitat improvement structures have the potential to disrupt the natural appearance of a given view. This can be mitigated by following the Visual Resource Management direction in Chapter III of the Forest Plan.

On Cultural Resources - Installing wildlife improvement structures or vegetative treatment practices create the chance of destroying undiscovered sites and artifacts. Performing site surveys prior to project activity, as directed in the Plan, will mitigate this risk.

On Wilderness - Fish and wildlife habitat management practices such as vegetation treatment or the installation of structures is not generally permitted in wilderness. One exception to this is the special management actions designed to enhance the Situation I grizzly bear habitat. These practices allow for man-made facilities to be installed within wildernesses to prevent grizzly bears from being rewarded by obtaining food from campsites. The facilites that might be found at designated campsites include bearproof storage containers, meat poles (at hunting camps), elevated platforms, and portable electric fences.

In the Glacier Addition to the Fitzpatrick Wilderness (Whiskey Mountain), vegetation treatment and limited other management activities may be accomplished in accordance with the Wyoming Wilderness Act of 1984 (see direction for Management Area 8E in Chapter III of the Forest Plan).

On Fish and Wildlife - All of the alternatives maintain or increase big game winter range carrying capacity. A major difference in carrying capacity among alternatives results from a different number of acres being treated per planning period. Table IV-12 displays the habitat capability which would be lost through replacement of aspen by conifers over the planning period. Table IV-13 displays the potential sustained increase in numbers of animals over the planning period due to treatment of sagebrush. In both tables the increases are achieved in the first decade and treatments thereafter will sustain this increase. Elk are the main concern of the State of Wyoming. Although deer are not displayed in the tables, they will also benefit from treatment.

Tables IV-14 and IV-15 display the percent of the Shoshone National Forest portion of herd unit population objectives established by the Wyoming Game and Fish Department in 1985 met in each alternative. Herd unit objectives are met in most cases due to reservation of all CPWR for wildlife. In the North Fork elk herd unit, analysis of available inventory data indicates that the herd unit objective is not obtainable regardless of forage treatments and management strategy. Table IV-16 displays long-term trends for management indicator species.

Forage reserved for wildlife from suitable domestic livestock range is greatest under Alternatives C and E and the least under Alternatives A and D (see Table IV-10). While Alternative E seems most attractive for wildlife, much of this additional forage is from removal of livestock from allotments in nonwinter ranges and does not result in a large increase in wildlife forage where it is needed.

Fish and fish habitat are maintained and/or enhanced primarily through protection of riparian areas by guidelines or management fencing. Alternatives providing for intensive grazing systems generally tend to benefit fisheries the most as riparian areas are fenced into smaller units and utilization by livestock can be more effectively monitored.

The effects on wildlife and fish recreation use by alternative is shown in the RECREATION section.

TABLE IV-12

Aspen Habitat Capability

Item	Alternatives A Current	 B Commodity Emphasis	 C NonCommodity Emphasis	 D Preferred	 E Reduced Budget	 F RPA
Maximum Treatable Acres	6440	6440	6440	6440	6440	6440
Acres Treated Over Planning Period	4500	4940	4800	4500	2620	4380
Acres Not Treated	1940	1500	1640	1940	3820	2060
Elk Habitat Capability Lost Through Lack of Treatment*	-76	-59	-65	-76	-150	-81

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* Potential number of animals based on forage production (aspen scorecard) lost through replacement of aspen by conifers over the planning period.

TABLE IV-13

Sagebrush Habitat Capability

Item	Unit of Measure	Alternatives					
		A Current	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
Total Sagebrush Treatment	Average Annual Acres Treated	258	340	340	348	225	319
Elk	Average Annual Acres Treated	196	258	258	264	171	242
	Animal Months	59	77	77	79	51	73
	Number of Elk Per Year 1/	10	13	13	13	9	12
	Number of Elk Per Decade 1/	100	130	130	130	90	120
Bighorn Sheep	Average Annual Acres Treated	62	82	82	84	54	77
	Animal Months	37	49	49	50	32	46
	Number of Bighorn Sheep Per Year 1/	6	8	8	8	5	8
	Number of Bighorn Sheep Per Decade 1/	60	80	80	80	50	80

1/ Sustained increase in numbers over the planning period due to treatment of sagebrush.

TABLE IV-14

Elk Herd Unit Populations

Herd Unit Name and Number	1985 State Population Objective 1/	Percent of SNF[2] Portion of 1985 State Population Objectives Met					
		Alternatives					
		A Current Direction	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
Clarks Fork 17	3550	100	100	100	100	100	100
North Fork 16	2300	57	60	74	63	92	57
Carter Mountain 15	2000	100	100	100	100	100	100
Gooseberry 14	1800	100	100	100	100	100	100
Wiggins Fork 35	4000	100	100	100	100	100	100
Warm Springs 36	800	100	100	100	100	100	100
Lander 37	2200	100	100	100	100	100	100

1/ Numbers of Animals

2/ Shoshone National Forest

TABLE IV-15

Bighorn Sheep Herd Unit Populations

		Percent of SNF[2] Portion of 1985 State Population Objectives Met					
		Alternatives					
Herd Unit Name and Number	1985 State Population Objective 1/	A Current Direction	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
Clarks Fork 1	500	100	100	100	100	100	100
Trout Peak 2	440	100	100	100	100	100	100
Wapiti Ridge 3	875	40	100	100	100	100	100
Yount's Peak 4	900	100	100	100	100	100	100
Franc's Peak 5	1000	100	100	100	100	100	100
Dinwoody-Gannett Peak 9	400	100	100	100	100	100	100
Jakey's Fork-Green River 10	560	100	100	100	100	100	100
Temple Peak 11	11	250	100	100	100	100	100

1/ Number of Animals

2/ Shoshone National Forest

TABLE IV-16

Management Indicator Species Trends Compared to Current Alternative

	Alternatives				
Species	B Commodity Emphasis	C NonCommodity Emphasis	D Preferred	E Reduced Budget	F RPA
Grizzly Bear	0	0	0	0	0
Gray Wolf	0	0	0	0	0
Bald Eagle	0	+	0	+	0
*Peregrine Falcon	+	-	0	-	0
Black Footed Ferret	0	0	0	0	0
*Mule Deer	-	0	0	0	0
Elk	+	+	+	+	+
Bighorn Sheep 1/	+	+	+	-	+
Moose 2/	0	-	0	-	0
Mountain Goat	0	0	0	0	0
*Pine Marten	0	0	0	-	0
Goshawk	0	0	0	-	0
Brewers Sparrow 3/	-	-	-	+	-
*Hairy Woodpecker	-	0	0	+	0
Beaver 4/	+	+	0	-	-
*Blue Grouse	-	0	+	+	+
*Ruffed Grouse	+	0	0	-	-

(-) indicates a downward trend.
(0) indicates a stable trend.
(+) indicates an upward trend.

* stable is indicated if there is less than a +/- 5 percent change over the planning period.

1/ Based on amount of sagebrush treated for bighorn sheep.
2/ Based on amount of willow treatment.
3/ Based on amount of sagebrush treatment.
4/ Based on amount of aspen treatment.

On Threatened and Endangered Species - Maintenance of habitat conditions necessary to attain T&E species objectives would be accomplished by implementation of Shoshone Management Prescription 4B, by following the grizzly bear guidelines, and by conducting appropriate project-specific biological evaluations.

On Range - Vegetation treatment practices on crucial preffered winter range that increase the amount, composition and diversity of forage vegetation benefit the range resource when the increased forage production is usable by domestic livestock. Domestic livestock can only share use of these increases so long as sufficient forage remains to support wintering wildlife. When utilization standards have been reached, mitigation measures call for moving livestock off the area to assure that sufficient winter forage is available for wildlife.

On Timber - Protection and improvement of habitat would have little effect on the timber program in any alternative. Wildlife habitat improvement by timber harvest called for in each alternative does not alter the treatment schedule which is optimum from a timber scheduling standpoint. Some tentatively suitable timberland is not suited in Alternatives B and F because of enhancement efforts for grizzly bear habitat in these alternatives (amount of Management Area 4F applied).

On Water and Wetlands - Riparian habitat enhancement projects could degrade water quality during project construction in the short-term, but it would improve water quality in the long-term by decreasing bank sloughing. Riparian Area management General Direction and Water Resources Improvement and Maintenance General Direction 3 of Chapter III of the Forest Plan would mitigate potential problems under all alternatives. Some stream habitat improvements, such as fish overpours that would oxygenate water, would improve water quality under all alternatives.

Water yield would increase as a result of patch clearcuts, including aspen treatments made to improve wildlife habitat. This effect would occur in proportion to the acres of habitat improved and would be greatest under Alternative B and least under Alternative E.

On Soils - Habitat improvement programs such as burning, timber harvest, riparian fencing, cutting/slashing, etc., can have either negative or neutral effects on the soil resource. Of these, timber harvest has the greatest potential for having a negative effect on the soil resource. Analysis contained in planning records indicates that lands suitable for harvesting timber have low potential for accelerated erosion. Suitable timber lands have a high or moderate compaction hazard. Minimum standards and guidelines should mitigate possible negative soil resource impacts. It is expected that the Fish and Wildlife program will have a net neutral effect on the soil resource.

On Fire - Vegetation treatments to improve wildlife habitat would increase the risk of an escaped fire, but the long-term effect of reducing fuel loads and continuity would result in reduced fire intensities and rates of spread. This, combined with improved access, would reduce the risk of catastrophic fire.

On Insect and Disease - Vegetation management to improve wildlife habitat would improve horizontal diversity and reduce the potential for spread of insects and diseases. This effect would occur under all alternatives in proportion to acres of wildlife habitat improvement displayed in Table IV-9 and program outputs above. It would occur most under Alternatives B and D, and least under Alternative E.

On Air - Clearcuts to improve habitat would reduce air quality temporarily. The effects would include dust and emissions from heavy equipment. These effects would correspond by alternative to the acres of wildlife habitat improvement reported in Table IV-9. Air quality would be restored when the management activities are completed.

RANGE

The range program includes allotment management planning, grazing permit administration, range analysis and achieving or maintaining range in a satisfactory range condition by intensive management and structural and nonstructural improvements.

Allotment management plans will be guided by the Forest Plan Detail (Appendix J of the Plan). The Plan Detail lists the practices to be applied within a range allotment such as: vegetation treatment by mechanical practices, prescribed burning, and chemicals; control of noxious weeds and poisonous plants; and construction of structural improvements such as water developments and fences.

Intensive grazing systems such as rest rotation and deferred rotation are generally more effective than season-long extensive grazing systems in producing a greater quantity of desirable forage and improving or maintaining range condition. Due to the extreme elevation ranges and short growing season on the Forest, most allotments lack the potential for achieving true rest rotation or deferred rotation grazing systems, but modifications of these systems can be put in effect. All rangeland in less than satisfactory condition will be improved as directed by the Federal Land Policy and Management Act of 1976. The time required to improve deteriorated (unsatisfactory) range conditions will depend on the level of authorized grazing use, the intensity of grazing management and the priority of funding for individual allotments.

Program Outputs

Table IV-17 displays authorized grazing levels on the Forest by planning period for each alternative. The table represents capacities on suitable rangelands and includes both primary and secondary range. In the long-term, all alternatives except E would result in increased grazing capacities over the present level. Reductions in permitted livestock numbers Forest-wide would be required initially in Alternatives C and E. While Alternatives A, B, D and F would not decrease permitted domestic livestock numbers Forest-wide, reductions in numbers would occur on some allotments to provide for wildlife forage needs and to adjust stocking levels to meet existing capacities. Conversely, upward adjustments would be available on some allotments that are presently stocked below existing capacities for domestic livestock. Under all alternatives except E, substantial increases in intensive range management activities, water developments, fencing and sagebrush treatment would be required to accommodate the increased grazing levels projected. (See Appendix J of the Forest Plan for a summary of range improvements needed in the first 10 year planning period.)

TABLE IV-17

Estimated Authorized Livestock Grazing Capacity
(Thousand Animal Unit Months per Year)

Planning Period		Alternative					
		A	B	C	D	E	F
1	Cattle	76.6	78.6	55.3	78.0	35.3	81.6
	Sheep	35.2	37.9	31.5	25.4	1.7	33.1
	Total[1]	83.6	86.2	61.6	83	40.9	88.2
2	Cattle	76.6	78.6	55.3	78.0	35.3	81.6
	Sheep	35.2	37.9	31.5	25.4	1.7	33.1
	Total	83.6	86.2	61.6	83	40.9	88.2
3	Cattle	104	105	75.7	105	44.6	109
	Sheep	43.2	47.8	37.5	32.2	2.03	42.9
	Total	113	115	83.2	111	52.3	118
4	Cattle	108	109	79.7	110	46.3	114
	Sheep	44.9	49.9	39.7	33.8	2.03	45.4
	Total	117	119	87.6	117	36	123
5	Cattle	108	109	79.7	110	46.3	114
	Sheep	44.9	49.9	39.7	33.8	2.03	45.4
	Total	117	119	87.6	117	36	123

[1] Totals are expressed in cattle AUMs (sheep AUMs are divided by five to convert them to cattle AUMs)

Alternative E offers the least opportunity for grazing due to implementation of a reduced management program and the resultant inability to achieve intensive management systems and structural and nonstructural improvements.

Environmental Effects

On Vegetation - Rangeland would be improved to satisfactory condition under all alternatives. Range improvement would reduce the amount of land currently supporting sagebrush in an old growth stage by placing treatable sagebrush in a rotation. This will produce an even distribution of forage and sagebrush age classes from the grass/forb to the old growth stages on acres treated. The number of acres treated is insignificant compared to the total acres of sagebrush currently existing. Treatment would increase vegetative diversity and have an net positive effect on vegetation.

On Recreation - Grazing on allotments with high levels of recreation use will have conflicts. Where conflicts occur, AUM capacity would be maintained through more intensive management of the allotment to separate the conflicts. Cattle or sheep grazing, bedding or watering in or around developed sites could damage these areas and annoy users. Fencing and intensive stock management will reduce the potential for such conflicts. Range fences and the movement of stock on and off allotments may annoy hikers and campers. This can be reduced through more careful timing of range activities to avoid heavy recreation use periods.

On Visual Resources - The most significant impact of range management on the visual resource is vegetation treatments such as chaining, prescribed burning and chemical treatment. These activities can result in contrasts in color and texture, as well as linear deviations. However, by following the visual management standards and guidelines in the Forest Direction and Management Area Prescriptions, such projects can enhance the visual quality by increasing vegetative variety and by featuring existing land and water forms. Range management structures such as fences, corrals and water developments can usually be blended with the character of the landscape and have little adverse effect on the visual quality of an area.

On Cultural Resources - Cultural resources can be damaged by range improvement practices such as water developments or vegetation treatment. Concentration of livestock can also be destructive in areas used for corrals or salting grounds. Adverse effects can be significantly reduced by avoiding significant cultural resource sites and through the use of specific site surveys made prior to project activities.

On Wilderness - Grazing of livestock in designated Wildernesses is permitted where established prior to designation. Certain range management practices and structures are authorized in wilderness. These include small water developments, fences, the use of motorized equipment,and line cabins. With such management comes strong direction to conform in every way possible to the wilderness concept, including requirements to schedule periods of use, use of primitive transport and blending of structures with the natural environment. The presence of livestock within a wilderness is considered by some to be inappropriate and detrimental to the wilderness experience, but this is unavoidable and will occur in all alternatives to varying degrees.

On Wildlife - Wildlife habitat (including T&E species habitat) would be improved under all alternatives as a result of improving range condition and implementing intensive grazing systems that would distribute grazing use more evenly throughout an allotment. This is especially true for riparian areas. Treatment that temporarily converts sagebrush to grasslands would increase forage available for elk on elk winter range. The large increases in forage for wildlife under Alternatives C and E is the result of reductions and/or elimination of livestock grazing from several analysis areas. These wildlife benefits are only realized on units containing wildlife winter range which is the limiting factor for big game species on the Forest. Although most alternatives propose increases in range capacity for livestock over time, the major part of these increases will be made by improved range conditions and structures and will not decrease the forage available for wildlife on the critical winter ranges. In all alternatives, forage available for wildlife on their critical winter ranges will be increased over present conditions by adjusted livestock stocking levels by allotment.

On Fish - The implementation of intensive grazing systems such as modified deferred rotation and rest rotation would improve riparian areas and streambank stability in the long run under all alternatives. The improvement in grazed areas would be less under Alternative E because fewer acres would be under intensive grazing systems. Significantly reduced grazing in Alternative E would generally be beneficial to riparian or aquatic ecosystems.

On Range - Rangeland would be improved to satisfactory condition under all alternatives. The amount of time needed to reach satisfactory conditions depends on the grazing system and improvements for each alternative by prescription for each implementation unit. Range improvement practices would reduce the acreage of sagebrush and increase the acreage of grass. The magnitude of this effect would correspond with the acres treated as shown in Tables II-5 and II-6.

On Water and Wetlands - Range effects described under Soils relate to general watershed condition and potential sedimentation. Direct effects of grazing on the water resource result from grazing along stream channels and in riparian or lakeside wetlands. Increased grazing over time under all alternatives except E would entail an increased risk of watershed conditon decline and cumulative adverse effects. Effects specific to wetlands and streams are not necessarily related to increased or "excessive" grazing, but to the level of rangeland administration applied.

Excessive trampling of wet soils affects conditions for riparian vegetation growth and results in hummocking, drying and general degradation of the area. Overutilization of forage saps the vitality and variety of riparian vegetation and can result in long term shifts in the vegetation mix to less desireable species. The combination of trampling damage and overutilization changes the hydrologic function of the riparian vegetation, which is to filter sediments, maintain soils, slow down peak flows, and store and filter hillslope drainage. Livestock break down streambanks over a period of time, when moving to and from watering. This creates an ongoing source of sediment which can affect stream values and channel characteristics downstream. Cattle defecating and urinating in or near streams results in chemical and biological pollution, particularly when unfavorable changes in soil and vegetation characteristics have previously occurred. Such conditions can result in violation of water quality standards, particularly in wilderness, and affect the use of water downstream for fish habitat, recreation, aesthetic and domestic purposes.

Alternative E would minimize the area subject to such effects, but monitoring and administration of other grazed areas would probably decline. The potential cumulative effects and effects on wetlands and riparian ecosystems vary with numbers of livestock AUMs permitted. The greatest increase above present through the fifty year period occurs in Alternative F, and the least in Alternative C. Alternative E provides fewer permitted numbers than at present, throughout the five decades. Alternatives A, B and D provide similar substantial increases in grazing over time.

The range program, as described, with objectives of improved range condition, and improved livestock distribution through fencing and water development, would result in improved watershed condition. Application of Forest Direction and management prescription standards and guidelines for riparian area and water quality management would minimize the risk of adverse impacts from grazing. Impacts over time would be controlled through appropriate levels of water monitoring and range analysis and administration.

On Soils - Livestock grazing decreases plant cover, disturbs the surface layer of soil, increases or decreases water infiltration and channels water across the surface of the land. Range improvement practices such as water development and fencing tend to concentrate cattle on very small portions of the land surface causing compaction, thereby reducing infiltration rates and creating channels (trails). This increases erosion potentials on minor portions of the landscape. Areas where cattle are driven or herded to and from the range are subject to significant erosion. Range improvement practices such as spraying, burning and intensive grazing remove vegetative cover for short periods of time and tend to concentrate cattle use by attracting them to more desirable grazing areas or by forcing them to use certain areas.

Soil productivity can be affected through erosion. Displacement of topsoil results in a net loss of nutrients available to plants through physical removal which in turn affects the natural equilibrium that exists between microorganisms, organic matter incorporated into the soil surface layers and climatic conditons. Physical removal tends to have a large impact on the microorganisms responsible for supplying plant nutrients.

Estimated accelerated erosion (i.e. man-caused) is considered to be of a lower magnitude, Forest-wide, than the annual variation in natural erosion rates caused by climatic conditions. It is therefore not expected that erosion would affect soil productivity significantly in a general sense. The potential for soil productivity loss may be significant, however, from a local standpoint. This loss may be magnified by consequent related effects on vegetation, visuals and water quality in a particular area.

Cattle trails, water areas, loafing areas and cattle driveways are considered to be facilities in the same manner as are roads or trails. Any such areas which reach a problem stage in terms of gully development or sheet erosion (off-site impacts) are to be identified and managed through the range or watershed improvement programs.

Soil productivity is usually not affected through range practices such as spraying, burning, or controlled grazing. Such practices simply concentrate nutrients and hence growth on desired species. While burning releases nutrients "tied up" in above ground plant materials through rapid mineralization, most nutrients which infiltrate the soil are "tied up" in microorganisms and changed to a form available for plan root uptake. As a result, burning, spraying and controlled grazing when used to control undesirable plant species, do not result in increased soil productivity. Fertilization will result in a short-term increase in soil or site productivity.

An analysis was done to estimate natural erosion rates and potential accelerated erosion resulting from grazing on all National Forest system lands with suitable grazing lands. The combined effects of timber and grazing are estimated to result in less than a two percent increase in erosion, Forest-wide, for all alternatives. Table IV-26 presents estimated erosion increased by alternative. Most of the increase shown is attributable to livestock grazing. Potential local erosion effects of grazing would be least under Alternatives C and E, and greatest under Alternative A. Standards and guidelines in Chapter III of the Plan, combined with soil monitoring, are designed to mitigate these effects.

There have been problem areas identified where the net effect of grazing on soils is negative (see Plan Appendix G, Watershed Problem Assessment). Standards and guidelines for all alternatives provide for the systematic treatment of these areas to improve their condition. Implementation is likely to be difficult under Alternative E, due to reduced budgets.

Potential cumulative effects are viewed in a relative sense according to total numbers of permitted livestock shown in Table IV-17.

On Facilities - Livestock congregating along roads and trails can cause sloughing of banks and cut and fill slopes. Through proper design and location of roads and trails, reseeding of disturbed areas with nonpalatable forage species, and proper allotment management, the effects of range activity can be mitigated. The intensity of effects under each alternative is directly proportional to the existing road and trail miles and the number of AUMs. Effects are not expected to be significant, with mitigation.

On Fire - A risk of an escaped fire arises from treatment of vegetation with prescribed burning. Properly prepared and implemented burning plans will ensure that the risk of fire damage from range burning is minimized in all alternatives.

On Air Quality - Range improvement projects would temporarily reduce air quality with dust and emissions from heavy equipment and smoke from prescribed burns. The magnitude of these effects would correspond with the acres of treatment reported in Tables II-5 and II-6. Air quality would be maintained to meet state and federal standards.

TIMBER

Changes Between Draft and Final EIS

Based on a number of comments, timber harvests and harvest scheduling were reanalyzed between draft and final. This involved changing the manner in which timber roads were accounted for. Accordingly, the timberland classified as suited for timber management decreases in all alternatives except Alternative B. The acreage of "suited" land in the 1976 Timber Management Plan was 93,500 acres. The acreage of suited timberland is less than this in all alternatives with the exception of Alternative B. This means that fewer acres will be managed for timber, less roads will be constructed for such management, and the ability to treat existing insect and disease problems on the Forest decreases slightly. Generally, decreases in suited timberland occured in stands with low productivity or steep slopes. This loss is compensated somewhat by increases in timberlands having moderate and high productivity.

Harvest levels for the first decade (allowable sale quantity) remain at about the same level as in the DEIS for all alternatives. The difference in acreage managed for timber affects harvests planned beyond 30 years from the present. These remain at about the same level as the first decade harvest rather than increasing. The long-term sustained yield levels decrease in all alternatives from the levels shown in the DEIS, except in Alternative B.

Timber Program

The timber program on the Forest is aimed at managing the suited forested lands to maintain a healthy, productive condition. The timber program includes activities such as timber sale preparation, timber harvest administration, site preparation for tree regeneration, tree planting, timber stand improvement through thinning and timber inventory surveys. Forest-wide effects of timber management are minor because only six percent of the Forest is tentatively suitable. In all alternatives this amounts to treating less than 0.5 percent of the Forest in any single decade through timber management.

All lands on the Forest were evaluated to determine suitability for timber production (see Appendix C). This evaluation was based on the ability of lands to support commercial stands of timber and resulted in the identification of 144,682 acres "tentatively suitable" for timber production. Under each alternative, lands scheduled to be managed for timber production were selected from the tentatively suitable land base and were classified as "suited" lands. Tentatively suitable lands not selected for timber production under an alternative were added to lands designated as not suitable. Because lands selected as suited depend on the management objectives (including multiple-use access requirements) of an alternative, the number of suited acres varies by alternative. Table IV-18 displays the number of suited acres by alternative.

Tree Removal on Lands Not Suited for Timber Production

Lands not suitable for timber production are located throughout the Forest where road construction and management costs are high. Administrative and developed recreation sites (excluding winter sports sites) are also considered not suitable for timber production. The acres of unsuitable lands were not

TABLE IV-18

Distribution of Tentatively Suitable Land by Alternative*
(In Thousands of Acres)

	Alternative					
	A	B	C	D	E	F
Capable, Available and Tentatively Suitable Acres	144,682	144,682	144,682	144,682	144,682	144,682
Suited Acres	89,000	106,000	71,000	85,400	24,700	82,900
Not Suited Acres	55,682	38,700	73,680	59,282	119,980	61,780

* For complete analysis, see Appendix C.
Note: Forest acreage is 2,433,125.

included in the calculation of allowable sale quantity or long-term sustained yield capacity. While regulated timber production is not permitted or planned, tree removal may occur to meet other resource objectives. Any volume of timber removed from lands classified as not suitable is not chargeable to the allowable sale quantity. Tree removal from such lands may be appropriate under the following conditions:

1. Salvage or sanitation of stands which are damaged by fire, insects, windthrow or other catastrophe, or which are in imminent danger from insect or disease attack.
2. Cutting of trees for research to gain knowledge about tree growth, insect or disease organisms, or the effect of harvesting on other resources.
3. Removal of trees to promote safety of Forest users such as hazard tree removal in camp and picnic grounds, administrative sites, and along roads open to the public.
4. Tree cutting to meet specific habitat needs of threatened or endangered animal or plant species, and to improve or protect the habitat of other wildlife.
5. Tree cutting to improve the visual resource by opening scenic vistas or improving visual variety.
6. Removal of dead material for any product such as firewood, fence posts and poles.

7. Cutting of Christmas trees and removal of transplants.
8. Harvesting timber to improve water yields when permanent openings are created. (No investment in reforestation practices will be made.)
9. Creation of openings for powerlines, roads and other facilities.
10. Harvesting to meet short-term forage production objectives for livestock or wildlife.
11. Cutting aspen to maintain wildlife habitat and visual resource objectives.

Program Outputs

Tree Removal on Suited Lands - The goals and objectives of each alternative provide the basis for constraints used in the FORPLAN model (Appendix B), which in turn determines the average annual live timber volume available for sale by planning periods. Resource management objectives, the area of suited land, and the silvicultural activities applied determine the volume produced. Table IV-19 displays the allowable sale quantity by alternative for each ten year time period. Allowable sale quantity is defined as the maximum quantity of timber that can be sold from the area of suited land. Live volume removed from suited lands that meet utilization standards is both regulated and chargeable against the allowable sale quantity.

A long-term sustained yield capacity is also calculated for each alternative and displayed in Table IV-19. This is the highest uniform yield of live timber that may be sustained from lands being managed for timber production under a given set of multiple use objectives. It is an indication of the Forest's potential for wood production under a specified management intensity, consistent with the objectives of an alternative.

Annual Acres Treated Silviculturally - Acres treated with silvicultural methods vary between alternatives. Goals and objectives of each alternative affect both the number of acres to be managed for timber and the selection of different mixes of silvicultural treatments. Differences in acres selected as suited are affected by the road network needed to support the multiple-use management strategies chosen within each alternative in a cost efficient manner. The strategies selected under the maximum present net value benchmark provide access for timber management of 80,504 acres. Changes in multiple-use management strategies by alternative change the basic access considerations for timber management. This is the major reason that suited acres vary by alternative. Without constraints on the amount of timber produced, economic efficiency considerations alone call for an allowable sale quantity of between 10.5 MMBF and 11.2 MMBF. Alternative B has a constraint requiring production of about 13 MMBF per year during the first decade. Alternative C has a constraint to keep first decade timber harvest to less than 8 MMBF. To make Alternative E produce any timber, a constraint requiring production of at least 3 MMBF is needed. Other alternatives allow economic efficiency to set the allowable sale quantity.

TABLE IV-19

Average Annual Live Timber Volume by Alternative and Period*

		Allowable Sale Quantity		Potential Long-Term Sustained-Yield Capacity	
Alternative	Period	MCF	MMBF	MMCF	MMBF
A	1	2584.	11.5		
	2	2584.	11.5		
	3	2674.	11.9		
	4	2674.	11.9		
	5	2674.	11.9	3596	16.0
B	1	2900.	12.9		
	2	2900.	12.9		
	3	2900.	12.9		
	4	2900.	12.9		
	5	2900.	12.9	4157	18.5
C	1	1798.	8.0		
	2	2089.	9.3		
	3	2089.	9.3		
	4	2089.	9.3		
	5	2089.	9.3	2944	13.1
D	1	2517.	11.2		
	2	2517.	11.2		
	3	2539.	11.3		
	4	2539.	11.3		
	5	2539.	11.3	3461.	15.4
E	1	686.	3.		
	2	686.	3.		
	3	686.	3.		
	4	686.	3.		
	5	686.	3.	906.	4.03
F	1	2427.	10.8		
	2	2472.	11.0		
	3	2472.	11.0		
	4	2472.	11.0		
	5	2472.	11.0	3281.	14.6

*Utilization standards asssumed for estimating volumes were that trees had to be at least 7 inches in diameter with at least 6 inch diameter tops.

TABLE IV-20

Average Annual Silvicultural Treatments by Alternative and Period (Area in Acres)

Alternative	Period	Intermediate Cut Acres	Clearcut Acres	Shelterwood Seed cut Acres	Shelterwood Removal Cut Acres	Selection Cut Acres	Total Acres
A	1	246	274	455	375	966	2315
	2	64	191	459	497	1304	2515
	3	192	224	480	455	1134	2486
	4	0	74	462	611	1531	2678
	5	164	201	610	523	1134	2632
B	1	347	471	387	399	1014	2618
	2	55	570	192	447	1369	2634
	3	164	398	662	412	1194	2829
	4	0	469	279	195	1611	2554
	5	121	312	829	662	1194	3118
C	1	298	144	350	375	496	1663
	2	29	175	426	462	669	1761
	3	191	263	380	350	750	1714
	4	0	92	359	543	1013	2034
	5	144	147	489	479	750	2052
D	1	285	258	444	367	920	2274
	2	64	205	435	489	1242	2434
	3	192	208	462	444	1086	2393
	4	0	85	427	586	1467	2565
	5	165	181	578	509	1086	2519
E	1	445	0	38	282	105	870
	2	24	184	49	22	142	421
	3	345	35	111	44	192	727
	4	0	191	35	59	218	504
	5	224	32	118	146	192	711
F	1	235	247	407	395	911	2195
	2	24	182	430	477	1230	2343
	3	225	214	442	407	1084	2372
	4	0	67	404	543	1464	2477
	5	159	192	540	511	1080	2486

Differences in acreage treated by various silvicultural treatment are due in part to varying acreages of suited timber land. Also, the cost of such practices, the flow of timber produced, and the per acre yield of timber under various silvicultural regimes affect the amount of the suited land base treated by each type of silvicultural practice. In all alternatives, harvest method selection for each timber stand includes consideration of natural regeneration possibilities. The determination as to the most appropriate regeneration technique is done by examination of timber types, soils, landform and habitat type information. Table IV-20 displays the average annual silvicultural treatments by alternative. The individal silvicultural treatments are described in the following paragraphs.

Intermediate cutting is an entry into a stand between the time of its formation and its regeneration. In the context of this Plan, the intermediate cutting refers to commercial thinning. Very little commercial thinning would be programmed for the near future in any of the alternatives because: (1) with the majority of timber stands greater than 100 years old, there is little opportunity for effective commercial thinning (natural, unmanaged stands of 100 years and older are biologically not able to respond to and benefit from thinning); and (2) regeneration cutting contributes more to balancing the age class distribution. Intermediate cutting will be more important in later decades when regenerated, even-age stands are available for entry.

Clearcutting removes all trees meeting utilization standards from a stand or portion of a stand in one entry. The objectives of using the clearcut method include the creation of new even-aged stands, creation of openings in the forest to benefit other resource values, and protection of adjacent stands from insects and disease. Clearcutting may be an appropriate method in all forest types, but it is most applicable to lodgepole pine on this Forest. The differences in clearcut acreage between alternatives is due to the differing goals and objectives of the alternatives.

Shelterwood cutting is an even-aged regeneration method requiring two or three entries to regenerate a stand. A portion of the old stand is left to provide both a seed source and a sheltered environment for natural regeneration. The final entry to remove the last of the old stand is made after a new stand is established. Because of stand density, windthrow hazard and other site conditions, the shelterwood method is most appropriate for spruce and Douglas fir stands on this Forest.

Selection cutting is an uneven-aged regeneration method used to propagate and manage a forest stand when continuous forest cover and trees of all ages are desired. The selection method is difficult to apply properly due to regeneration requirements and diameter (age) class regulation.

The management requirements related to silvicultural prescriptions are included in the Forest Direction section of Chapter III in the Plan.

Analysis of alternatives included an analysis of the proportion of the Forest to be managed under even-age systems using shelterwood and clearcutting methods versus uneven-age management using selection harvest techniques. This analysis took existing stand age structure, cover type, landform, soil type, and habitat type into consideration for each timber strata. All silvicultural options, including selection harvest, were considered for every strata where each system was determined to be biologically viable and technically feasible. The choice of harvest and silvicultural system was based on the relative economic viability of each, needs for nondeclining flow of timber volume, and the specific response of each timber strata to various harvest techniques.

Firewood - Firewood for personal use is available from a number of sources on the Forest. The primary source is dead wood resulting from insect or disease killed trees. A second source of firewood is the unmerchantable portion of trees remaining after a sawlog sale (logging residue). This includes the tree tops and bole sections that do not meet minimum merchantable standards, and pieces with defects which prohibit use as sawlogs. The amount of this material available is directly dependent on the level of timber harvest which varies by alternative. A third firewood source is live, woody vegetation cut to achieve other resource management objectives. Commercial thinning for stand improvement also creates firewood supplies in this category.

Reforestation - The Forest has no reforestation backlog. As directed in Chapter III of the Forest Plan, silvicultural systems applied on the Forest are generally designed to regenerate trees naturally. However, a limited artificial reforestation program is necessary where natural regeneration is not successful. Artificial regeneration is included in all alternatives in order to meet legal requirements to reforest cut-over lands and respond to resource management objectives. Total artifical regeneration acres are less than one percent of all acres treated per year in any alternative except B, where nineteen percent of treated acres includes artificial regeneration.

Despite fuels management and modern fire control, wildfires will continue to occur. All alternatives provide for artificial reforestation when appropriate in mitigating the effects of wildfire on forested areas.

Environmental Effects

Timber management has a potential for direct, indirect and cumulative effects in a number of other resource areas. The type and magnitude of the effects are related to the level of timber activity and the mix of management practices in each alternative. Because of the relatively small portion of the Forest that is tentatively suitable timberland (see Table IV-18), Forest-wide effects of timber management do not vary significantly by alternative. However, timber management can have significant local impacts.

On Vegetation - Six percent of the Forest is classified as tentatively suitable timber lands. The maximum suited timber base is in alternative B. In this alternative, 106,000 acres are classified as suited. This amounts to about 4.4 percent of the Forest. Given average rotation periods, this means that less than 0.44 percent of the Forest will be harvested in any decade. Further, about 30 percent of that area will be treated using a selection harvest system. This means that the timber program in any alternative would have insignificant effects on total Forest vegetation diversity.

Vegetation characteristics tend to change frequently spatially due to a variety of climatic and landform characteristics on the Forest. Vegetation diversity already exists for these reasons. It is common for some age or structural classes to be absent in a given area. Generally old growth age classes predominate on the Forest in both suited and unsuited timberland. It would be expected that harvest activities would increase vegetation diversity in those areas. Silvicultural prescriptions that are favorable to other resource values such as wildlife, visuals and recreation could result in alternating stands where age and structural characteristics are different. Standards on application of even-age silvicultural treatments in all alternatives will provide for this mosaic. However, standards included in Alternatives C and D will generally produce this mosaic in ways that are more favorable to wildlife, visual and recreation values. This effect would vary commensurate with the level of timber harvest in the various alternatives.

Some areas of the Forest were cut heavily during the 1960's. This has left a few areas where timber stands dominated by young trees. In these areas, cover for wildlife and visual diversity would be impacted by significant even-age harvest of timber. All harvests programmed for the first 10 years were examined so that this situation could be avoided.

As stated, a significant portion of the suited landbase would be managed using selection harvest techniques in all alternatives. The effect of these harvests in an area would be to favor a tree species mix rather than single specie stands. Also, such stands are often intermixed with even-age timber stands. Managing such areas using a selection system helps provide diverse edge and cover requirements for wildlife.

On Soils - The potential for increased soil erosion and loss of productivity through erosion, compaction or physical removal of top soil would occur with increasing levels of timber harvest activities. This effect would occur in proportion to acres harvested using even-age harvest techniques. It would be greatest under Alternatives A, B, D and F, and least under Alternatives C and E. Analysis of potential accelerated erosion rates for suitable lands, by management activity, indicates that the estimated accelerated erosion rates are well within acceptable levels. However, localized temporary increases in the erosion rate above acceptable levels may occur. The risk of cumulative effects on soils is viewed in a relative sense by looking at suited acres by alternative (Table IV-18) and acres in clearcut or shelterwood systems by alternative (Table IV-20). Table IV-26 presents estimated erosion increases, by alternative, for timber and range practices combined.

On Visual Resources - Timber management activities would affect visual quality. In the long-term, timber management activities could result in a healthier, more visually pleasing forest environment if conducted with Visual Quality Objectives (VQOs). In this way, timber harvest would promote diversity and enhance viewing opportunities in some areas. VQO's are assigned to all areas of the Forest for each alternative. In areas with a Retention or Partial Retention VQO, timber harvests would be designed to blend with the landscape. In areas with Modification VQO, effects would dominate and appear natural only when viewed from background areas. It is important to note that the concentration and configuration of the harvests can affect visual quality more than the amount of harvest. Harvests included in Alternatives C and D are more favorable to visuals than those included in other alternatives.

Alternative E involves the least amount of cutting. As long as untreated timber stands remain healthy, this alternative would have the least effect on visuals. As timber stands grow older without treatment, there would be an increase in down timber, dead trees and discoloration due to insects and disease. There would also be the monotony of an unbroken canopy. This means visual quality would slowly degrade in untreated areas under Alternative E.

Alternatives A, C and D use timber management to enhance visual resources. Standards and guidelines favor retention to preservation visual quality for harvests in these alternatives. Alternative D would have the greatest positive impact of the three, and Alternative A the least.

On Cultural Resources - When timber harvest is scheduled, an on-site cultural survey will be performed under all alternatives. When a discovery is made or a cultural site is located, information would be recorded and mitigation planned (see Cultural Resource Management General Direction in the Forest Plan, Chapter III).

On Wilderness - Although timber management activities are not permitted within wilderness, activities adjacent to wilderness could affect the view from wilderness. Appropriate standards have been included in Alternatives A, C and D to mitigate such effects by harvest unit design.

On Water and Wetlands - Increased human activities in relation to timber harvest areas near streams can introduce a number of pollutants which affect water quality and water uses. These effects can last beyond the duration of the timber sale.

There is little potential, Forest-wide, to significantly increase sediment yields strictly by increasing water yield through vegetation treatment. There are some watersheds, notably on the Wind River District, that contain significant acres of tentatively suitable timber as to be a potential problem from this standpoint (see Plan Appendix G, Watershed Problem Assessment). In all alternatives, local impacts related to road construction, skidding, stream channel disturbance and accelerated erosion adjacent to streams are expected to result from the timber harvest program. The potential cumulative effects of such impacts, in terms of sediment, are relative to the total acres treated by alternative given in Table IV-20. Sediment production and transport can affect favorable conditions of flow in streams, damage water conveyance and storage facilities, degrade fish habitat, and degrade aesthetic values of water. On this basis, risk to water resources and uses is greatest in Alternative A and least in E. Alternative C provides the least risk, apart from E; timber harvest is limited to the most operable and productive lands, where large amounts of road construction are not required. Relative sediment yield increases are displayed by alternative in Table IV-23. These increases are produced, in part, by timber harvest and related road construction.

Potential short term effects in riparian areas would be loss of vegetation and increasing velocity of flows across floodplains. Both instances produce increased sedimentation and possible downstream effects. Application of Forest Direction and management prescription standards and guidelines are intended to minimize the risk of cumulative effects on water. Measures provided in Chapter III of the Plan under Water Resource Improvement and Maintenance and Riparian Area Management represent best management practices to meet nonpoint source pollution standards. These practices are aimed at mitigating the local effects of road construction and timber harvest.

Reforestation activities that are part of the timber program would reduce sediment yield. Artificial reforestation is necessary to mitigate increased sediment yield from harvested areas that do not regenerate naturally within the five year time limit.

Timber harvest activities would increase water yield to a degree. The amount of increase would depend on the shape, position, size and location of the cut. Increases in yield would correspond roughly to the acres harvested reported in Table IV-14. Although reforestation and tree growth would decrease water yield, the net effect of timber harvest activities over the planning horizon would be an increase in water yield for all alternatives. Cumulative changes in water yield are displayed by alternative in Table IV-21. Alternative B produces the greatest increase, and Alternative E the least.

On Air Quality - Timber harvest activities would temporarily reduce air quality with dust and emissions from heavy equipment and trucks hauling timber, and smoke from burning timber residues following harvest operations. The magnitude of these effects by alternative would correspond to the number of acres reported in Table IV-19. They would occur most under Alternatives A, B and D and least under Alternative E.

On Noise - Noise levels (mostly from heavy equipment and trucks) would increase in areas where timber harvesting operations are being performed.

On Fire - Timber harvesting would create residues that increase the short term potential for wildfire. Under all alternatives, this effect would be mitigated by fuel treatment requirements as specified in the Forest Direction (Plan, Chapter III). With this direction, timber harvesting over the long term would change the amount, distribution and arrangement of forest fuels, decreasing the potential intensity of wildfires. The ecosystem would be less dramatically altered by fire in treated stands than in natural timber stands. (See Fuel Treatment in the Forest Plan.) In general, fire prescriptions in suited timberlands call for quick response and fire suppression. Fire prescriptions in unsuited timberlands will allow fire to play a larger role in changing age class structures by allowing such fires to grow to specified sizes as long as they do not threaten areas of high resource value and the safety and health of the public. (For an illustration see fire prescriptions for the preferred alternative in Appendix F of the Plan).

During an active timber sale, workers and equipment associated with harvest activities would increase the potential for man-caused wildfires. This effect would be mitigated by early detection and suppression that would result from the presence of more people and the fire precautions required by the Standard Forest Service Timber Sale Contract.

Timber stand improvement (TSI), or thinning, would increase short-term fuel loading and consequently increase short-term fire potential. Thinning activities also would increase the risk of man-caused wildfire during the operation because of increased numbers of workers and equipment in the area.

Firewood gathering, which typically occurs within 200 yards of a road, would reduce the fire hazard by reducing the amount of dead and down material. On the other hand, the risk of man-caused wildfires would increase because of the greater number of visitors and more intense use of the Forest. This effect would again be mitigated by early detection and suppression.

Reduction in the amount of dead and down material by firewood gatherers would change the role of fire in treated areas. Because fire intensity would be reduced as a result of firewood gathering, vegetation succession would not be set back as significantly by wildfire. This effect would be about the same under all alternatives.

On Facilities - Timber management activities would require construction of new roads and would cause increased use, wear and user safety problems on roads. The magnitude of the effect by alternative would be in proportion to acres harvested reported in Table IV-20. These effects would be mitigated by road management, administrative road closures, and increased maintenance or reconstruction. Some new fences and cattleguards would be required to prevent cattle from drifting off allotments when natural timber barriers are logged.

On Wildlife - Timber management activities would affect vertical and horizontal diversity components of wildlife habitat.

Table IV-9 shows acres of wildlife habitat improved under each alternative. Some additional improvement would occur under the timber program. The extent of the improvement would depend both on scheduling vegetation treatments in areas where early successional stages are lacking, and on standards for such harvests. Due to the large amount of early successional stages and natural openings on some parts of the Forest, not all acres managed under even-age systems would directly benefit wildlife. Cover may be the limiting factor in such areas, rather than forage.

Horizontal diversity created by vegetation treatments would affect habitat capability, effectiveness and composition for wildlife species inhabiting the forested types. Clearcuts or shelterwood cuts would directly benefit species that favorably respond to edge, early successional stages and increased horizontal diversity. The extent of this benefit, however, is directly related to the effectiveness of the habitat. The juxtapositon of the cut units and the existing structural diversity determine how effective the habitat use will be. In this context, Alternatives A, B, E, and F are less sensitive to wildlife habitat requirements. Wildlife is a prime consideration in the design of harvest units under Alternatives C and D.

In addition, the activities associated with active timber harvests would displace species sensitive to human disturbance. Those alternatives that would have the most timber acres harvested would also have the greatest potential for disturbing the life cycles of species sensitive to the associated human activities. The effects would occur by alternative in proportion to the acres harvested displayed in Table IV-20 and the standards associated with such harvests in each alternative. Some of these effects will be mitigated through application of seasonal road closures.

Hiding and thermal cover would be reduced in some watersheds by timber harvest and timber stand improvement activities. The habitat for cavity dependent species would also be reduced as older trees are cut. Effects on hiding and thermal cover would be mitigated through dispersion standards on timber harvest. Also, the proportion of suited timberland that is managed using selection harvest will mitigate this effect to some extent. These effects would be limited under all alternatives by Forest Direction (see Wildlife Habitat Improvement and Maintenance and Wildlife and Fish Resource Management in Chapter III of the Forest Plan.)

On Fish - Timber harvest would increase stream sedimentation and reduce the quality of fish habitat. The amount of sediment that would reach the stream would be limited by protection of upland areas immediately adjacent to riparian areas and other mitigation measures in Forest Direction regarding riparian area protection. (See Wildlife and Fish Resource Management, Riparian Area Management, and Water Resource Improvement and Maintenance in Chapter III of the Forest Plan.) There could be cases where timber harvest would be beneficial to the fishery resources.

On Threatened or Endangered Species - Formal consultation with the U.S. Fish and Wildlife Service has determined that the proposed timber program will not jeopardize the continued existence of any threatened or endangered species. Refer to Plan Appendix H for results of formal consultation.

On Recreation Resources - Concentrated timber harvest activities would affect recreation resources in the area in which they occur. Timber activity could change some lands treated from one ROS class to another (i.e. from semiprimitive nonmotorized or semiprimitive motorized to roaded natural). This in turn would change the recreation opportunities available; by changing either the quality of the experience or the type of recreation opportunity itself. This effect is mitigated to a degree in all alternatives through the provision for closing roads built exclusively for timber management operations. Nonmotorized recreation opportunities will still be provided, but some users may find that timber harvest reduces the quality of that recreation experience.

On Insects and Disease - Timber harvest improves successional stage distribution, which in turn leads to a healthier forest that is less susceptible to damage from insects and disease. The presence or potential risk of insects and disease in a timber stand helps determine the priority of vegetation treatment for the stand. Thinning removes weaker, less healthy trees and improves spacing and conditions for growth, making stands less susceptible to effects of insect or disease. Clearcutting (up to 40 acres) can remove entire pockets of heavy concentrations of insects or disease. The net effect of timber management, though, will be slight because of the minor amount of the Forest managed for timber production in all alternatives. However, insect and disease susceptibility had a great impact on selection of rotation ages and thinning regimes in the timber harvest scheduling portion of analysis.

WATER RESOURCES

Water program management includes the following general activites:

Watershed Protection (including water quality monitoring)
Watershed Rehabilitation (Improvement)
Water Uses Management
Water Yield Improvement
Wetland (Riparian area) and Floodplain Protection and Management
(See Wetlands and Floodplains section)

Major effects on water resources are tied directly to vegetation treatment, road construction, grazing systems, subsurface minerals activities, concentrated recreation use and water developments. The water program is necessary to determine actual effects of such activities, prescribe adequate mitigation measures where necessary, and design rehabilitation projects where problems occur. Floodplain management is necessary to protect riparian values to minimize property loss, and to ensure public health and safety in the event of flooding.

Potential water programs affecting other resources include vegetation treatments to increase water yield and structural measures (snowfences) to improve the timing of runoff. The maintenance of instream flows and protection of Forest water uses can limit other resource activities in some water short areas. The protection of sensitive riparian ecosystems can affect the management of other resources. Similarly, water monitoring and watershed protection and rehabilitation practices add to the direct or indirect costs of managing other Forest resources.

Program Outputs

Water yield increases would result from vegetation treatment, primarily timber harvest, in all alternatives. Most timber in the Forest is not suited silviculturally for five to ten acre clearcuts that would maximize water yield, but increases would nonetheless be realized by decreased evapotranspiration in harvested areas. Alternative C (Noncommodity) includes timber harvest in selected areas where five to ten acre clearcuts are silviculturally feasible, and full stocking is possible within the prescribed time interval following harvest.

Snowfencing does not prove to be a cost effective technique for increasing yields or improving timing of flow. It is not evident that yields are significantly increased by snowfencing, therefore water increases were not included when that practice was applied. Snowfencing could delay snowpack melt, improving late summer runoff and soil moisture conditions on site, but these outputs are not valued economically. Alternative C does include snowfence construction where benefits for on-site range water development could be realized by delaying snowmelt. Implementation would result in an estimated 140 acre-feet available for late summer use.

Estimated average annual water yield increases are displayed by alternative over the planning period in Table IV-21. The estimated yield figures achieve some significance in comparing alternatives. Yield increases are not significant in comparison to the estimated average annual total yield for the Forest, which is 3,610,000 acre-feet. Yield increase figures include consideration of road miles, timber harvest for a variety of objectives and harvest methods, and regeneration of all created openings other than roads.

A general assessment of water that does not meet water quality goals is provided in Appendix G of the Forest Plan. This assessment is predicated on known or suspected watershed conditions that could presently be affecting water quality to a degree of noncompliance with state standards or Forest Service goals. Water quality data is not available to substantiate the relationship between declining watershed conditions and below standard water quality.

TABLE IV-21

Average Annual Water Yield Increase (Acre-Feet) Above Estimated Natural Yield (3.610 Million Acre-Feet)

	Alternative					
	A	B	C	D	E	F
Planning Period	Current Direction	Commodity Emphasis	Non-Commodity Emphasis	Proposed	Reduced Budget	RPA
1	2691	2951	2636	2650	1397	2653
2	3702	4085	3548	3609	1856	3511
3	4704	5450	4221	4516	1863	4372
4	4458	5541	4083	4318	2164	4143
5	5177	6501	4343	4903	1988	4667

Quantification of water meeting quality goals over time is based upon several assumptions:

- The relationship between declining watershed condition and below standard water quality is correct.
- Water quality monitoring as expressed in Chapter IV of the Plan is regarded as a minimum requirement to be implemented in all alternatives.
- Watershed rehabilitation is regarded as a minimum requirement, as directed by RPA, and projects will be funded accordingly.
- There is sufficient latitude in management requirements to delay timber harvests, deny oil and gas surface occupancy, alter grazing systems or reduce cattle stocking levels where declining watershed conditions and water quality problems have been demonstrated.
- All proposed activities are carried out with strict adherance to standards found in Forest Direction and Forest Managment Prescriptions found in Chapter III of the Plan.

With these assumptions, water meeting quality goals does not change by alternative, as shown in Table IV-22. If the assumptions do not hold, too many unknowns effectively prohibit quantification of this output. It should be noted that though there is a basis for each of the above assumptions, one or more of them are not likely to prove out in the near future. Lower funding is likely to occur regardless of the alternative which is implemented eventually. This would affect project funding and monitoring programs to the extent that projects would not be implemented and the existing water quality situation and trend would not be investigated.

TABLE IV-22

Water Meeting Quality Goals (Thousands of Acre-Feet per Year)*

		Planning Period				
	Present	1	2	3	4	5
All Alternatives	3,316	3,316	3,390	3,465	3,539	3,539

* Estimated total annual natural water yield is 3,610 thousand acre-feet.

In contrast to potential impacts approached project by project, the risk of cumulative impacts may not necessarily be mitigated by best management practices. The display of all activities and acres treated by alternative (summarized on Table II-5 and II-6) provides a relative indication of potential cumulative impacts on water quality. Using current direction as a basis of comparison, risk decreases in all alternatives (except A, where there is no change). It decreases only slightly in F. The least risk due to cumulative effects is associated with E because the reduced budget greatly decreases the emphasis on commodity production. Alternative C (noncommodity) is the next lowest in terms of risk for that reason, and because potential oil and gas operations would be restricted to a greater extent.

A broad assessment of watershed impacts shows that sediment is of primary concern (see Watershed Problem Assessment, Plan Appendix G). Roads, oil well pads, unimproved stream crossings, ground disturbance in riparian areas and grazing are among impacts that can accelerate erosional processes and boost the supply of sediment in streams. Timber harvest and the cumulative effect of many other activities in a watershed can increase water yields to a degree that excess sediment is carried in streamflows. This process is complex and beyond the scope of the present discussion. It is sufficient to say that at some point, the combination of increased flows or excess sediment supply will degrade channel characteristics and the quality of water for uses downstream. This concept was incorporated into a procedure for estimating sediment yield increases by alternative. Results are shown in Table IV-23; figures should be regarded as estimates, significant only in relation to each other. Total natural sediment yield for the Forest is estimated to be 1.3 million tons per year. Alternative A produces the greatest increase in sediment, and Alternative E the least.

Specific effects on water quality and water uses are discussed in the effects sections of other resource elements. See especially Range, Recreation, Timber Minerals and Facilities.

TABLE IV-23

Average Annual Sediment Yield Increase in Thousands of Tons*

	Alternative					
	A	B	C	D	E	F
Planning Period	Current Direction	Commodity Emphasis	Non-Commodity Emphasis	Proposed	Reduced Budget	RPA
1	24.9	25.2	17.4	24.2	8.0	25.5
2	27.8	25.4	17.5	24.4	8.02	25.7
3	28.1	25.8	17.7	24.6	8.03	25.9
4	28.1	25.7	17.7	24.6	8.08	25.8
5	28.4	26.1	17.9	24.8	8.07	26.0

*Estimated natural yield is 1.3 million tons per acre.

Standards and procedures included in Chapters III and IV of the proposed Plan are designed to: determine sediment yield thresholds; define effects of various levels and types of management; and provide the means to adjust management accordingly. In addition, Forest Direction and Management Prescription standards and guidelines are intended to prevent adverse impacts on water quality in all alternatives.

Grazing of domestic and transportation livestock, dispersed recreation use, foraging wildlife, outfitter and guide operations, lodge waste facilities and permanent corrals are all very often confined to narrow riparian areas along perennial streams. The individual and cumulative effects of such activities in and out of wilderness have the potential to introduce a variety of physical, chemical and biologic pollutants to streams. Such activities in the past have changed the physical character of some riparian ecosystems on the Forest to a degree that various instream water uses and quality values have declined.

Section 404 of the Water Pollution Control Act amendments of 1972, establishes a permit system, administered by the US Army Corps of Engineers, to regulate the placement of structures, excavation and/or discharge of dredged or fill material into the waters of the United States. Some Forest Service activities, and those of its permittees, such as road fills, riprap placement, bridge construction, boat ramps, diversion structures, and stream improvement structures may require a permit from the Corps of Engineers prior to construction. All such activities, if not covered by existing nationwide or general permits, must have an individual permit. The Shoshone National Forest will cooperate with the Corps of Engineers in obtaining the information necessary to administer the "404" Permit process on National Forest land, in order to protect aquatic and associated wetlands from unnecessary impacts.

The Forest does not contribute to a major or critical groundwater supply area, as determined by a UCLA study in 1982. Therefore, no impacts can be expected on such a structure by Forest management practices. Oil and gas exploration, development and production activities could affect such groundwater supplies as exist on or are recharged by the Forest area. Most effects associated with pre-exploratory drilling or seismic activity are expected to be of short duration. Exploratory drilling or production wells deeper than 1000 feet are of concern due to the potential for cross contamination of water bearing aquifers. These aquifers support Big Horn Basin agricultural and municipal uses of water. The potential for aquifer pollution exists under all alternatives; however, the implementation of standard mitigation measures and state procedural regulations will effectively minimize the risks. The same measures effectively protect water users dependent upon shallow aquifers (less than 200 feet deep) on the Forest.

Environmental Effects

On Recreation - There is no significant adverse impact of the Water Resources Program on recreation. The protective management of riparian areas, watershed rehabilitation and the monitoring of water quality are all beneficial to the recreation resource and to helping provide high quality recreation experiences.

On Visual Resources - Some watershed rehabilitation projects could have short term modification effects on the visual resource. In the long term, the overall effects of riparian area protection, watershed rehabilitation and water quality protection will serve to enhance the visual quality of treated areas. Under Alternative C, the use of small clearcuts for water production would likely have more adverse effect on visual quality than larger cutting areas which are easier to blend with the characteristic landscape.

On Cultural Resources - Only those projects where ground disturbing activities occur will have the potential to cause damage or loss to cultural resources. This potential can be reduced by conducting site surveys during project planning. (See Plan Chapter III, Forest Direction, under Cultural Resource Management.)

On Wilderness - No practices to increase water production will be carried out in wildernesses. Watershed rehabilitation activities, if any, will be small projects designed to eliminate problem areas caused by human or livestock use. The Wilderness Riparian/Aquatic Area Management Practices (Chapter III, Forest Direction), will serve to help protect one these elements of the wilderness resource.

On Fish, Wildlife, and Threatened of Endangered Species - The effects on fish and wildlife of the water program are positive under all alternatives in that water quality would be maintained or improved. Under Alternative C, vegetation treatments to increase water yield would affect vertical and horizontal diversity and therefore wildlife habitat. Five to ten acre clearcuts will provide additional forage areas for wildlife while maintaining cover requirements. The size of the forage areas created are less than optimum for wildlife foraging areas and the small amount of areas treated Forest-wide would have a minor overall beneficial effect for wildlife.

Watershed rehabilitation would improve wildlife habitat through maintained and improved forage production in all alternatives.

Riparian area protection and management would improve fish and wildlife habitat in all alternatives. Riparian management fencing offers the greatest potential for protection from overgrazing. Therefore, the alternatives offering the most wildlife and fish benefits from this practice are A, D, F, B, C and E respectively. Alternative E provides protection of riparian habitat through a reduced livestock grazing program.

On Range - The benefits for range are the same in all alternatives in that clearcutting would supply a temporary increase in forage until they become restocked. Alternative C contains clearcuts for water yield increases. However, the increase in temporary forage on these areas would be less than other alternatives due to a reduction in the overall timber program. Part of the cost of range management in some areas is the expense of water monitoring.

On Timber - Water program has an insignificant effect on the overall timber program for the Forest. The biggest impact is on location of roads needed to support timber operations. Water monitoring in some areas would add to the cost of timber management.

On Water and Wetlands - Water yield would increase over the planning period under all alternatives in response to vegetation management (primarily timber harvest and wildlife aspen treatments) and roads. Alternative B, with its emphasis on timber harvest and road system development, produces the greatest increase. Alternative C, which emphasizes water production objectives where possible, does not produce as much because of the shared emphasis on amenity values. Alternative E produces the least amount of water increase because of greatly reduced timber harvest.

The major thrust of the water program is intended to maintain or improve water quality and watershed condition. In carrying out the program functions of monitoring, wetland and floodplain management, and rehabilitation, there is a beneficial effect on water quality. Implementation of these three functions is not intended to vary by alternative, in terms of the effect on water quality. In reality, a lowered budget, as represented by Alternative E, would affect these functions. Water monitoring expenditures would necessarily vary according to levels of other resource activities that could affect water quality. As activities decrease in intensity or become concentrated in fewer areas, the monitoring job becomes easier and less expensive. Monitoring costs were entered for each FORPLAN prescription, using the Forest water resource monitoring plan as a guide. The analysis of alternatives indicates that Alternatives A and F would be the most expensive in terms of water monitoring, and Alternative E would be the lowest at less than half the cost. Monitoring levels are nearly as high for B and D as for A and F. Alternative C is intermediate between the two extremes.

Nothing suggested in any alternative prohibits water storage or development, except in Wild and Scenic River corridors. Forest Direction common to all alternatives addresses standards under which such activities would occur.

On Soils - Negative environmental effects on soils resulting from the water resources program are limited to increased erosion associated with increased runoff. Silvicultural prescriptions enhancing snow storage tends to provide higher runoff volumes and energies resulting in a potential increase for erosion. These effects primarily attend the timber program, except in Alternative C where water yield prescriptions are applied on a limited basis.

Water yield structures such as snow fencing involve little ground disturbance and have little effect on the soil resource. Other program outputs such as wetland and floodplain protection, water monitoring, etc., have a net positive effect on the soil resource. The overall net impact of the water resources program is judged beneficial to the soil resource.

On Fire - Slash created from clearcuts associated with water management would be treated, changing the amount, distribution and management of forest fuels in a way that would decrease the intensity of wildfires. Alternative C is the only one in which this effect is created.

On Air - Air quality would be affected, in the short term, by vegetation treatment activities to increase water yield in Alternative C. Emissions from heavy machinery, dust from trucks hauling timber and smoke from burning residues would reduce air quality temporarily during and immediately following timber cutting.

WETLANDS AND FLOODPLAINS

Program management includes all activities needed to meet direction provided by Executive Orders 11990 and 11998. Activities should include project planning for other resource uses or developments, planning and implementing improvement projects, and monitoring and evaluating wetland or riparian conditions in relation to other use levels or resource values.

Program Outputs

Outputs of this program are reported indirectly under other resource discussions involving riparian or aquatic dependent resources. These are, primarily, wildlife and fish habitat, vegetation, water quality, and water uses.

Wetlands

The placement of some developments or facilities in wetlands would have far-reaching impacts on riparian area dependent resources. Development of nonstream wetlands, including lakeside areas, can convert the hydrologic system from one of subsurface recharge to one of surface water flow. The consequences of such a change would include accelerated erosion and accumulation of erosional products in lakes and associated bottoms.

Clearing riparian wetlands or placing large amounts of fill material in them greatly alters the hydrologic function of the area. The riparian vegetation root matrix is effectively elimiated by this practice. Soil characteristics are altered by compaction and lack of cover. Incoming water is no longer effectively filtered, nutrients are not effectively cycled, recharge is greatly reduced and replaced by direct runoff. The sediment retention potential of streamside zones is eliminated in areas of disturbance, becoming instead a direct source of sediment. The effect of these changes will degrade water quality in adjacent streams by significantly increasing sediment loads and by increasing nutrients in the form of dissolved solids or ions adsorbed on newly contributed organic and soil materials. Changes in the stream's buffering capacity and in pH can be expected. Decreased subsurface recharge and increased runoff rates will raise stream temperatures and increase erosion and peak flows.

Increased hillslope runoff and decreased vegetation along streams will boost the size and velocity of flood flows, thus intensifying onsite and offsite impacts related to channel erosion.

The consequences outlined above can be greatly aggravated by the inclusion of stockpiled soils, reserve pits, pipelines and solid wastes. Apart from sediment, nutrients and thermal changes, there is also the possibility of loading wetlands with toxic elements, oil, grease, biological contaminants, and refuse. A large percentage of such pollutants would find their way into the stream system directly during development of riparian wetlands. Depending on the location of the development, a riparian buffer could retain some of these materials, but to the detriment of the vegetation and the wildlife which require it as habitat.

Increased sediment, temperature increases, pollution from nutrients, toxic materials, oil, grease, and other elements will affect downstream uses. Effects on water uses are discussed in the "effects" sections of other resource elements. The effects on wetlands as they apply to conservation and productivity of plants, fish and wildlife are presented those sections of the document. The effects on other wetland uses such as recreation and aesthetics similarly can be found in other sections.

Floodplains

Hazards associated with floodplains are twofold. First, a hazard exists with regard to human safety when facilities are located in floodways. Second, property loss is economically wasteful and potentially harmful to water quality and riparian or aquatic ecosystems.

Short-term activities such as timber harvest and seismic operations in floodplains presents a hazard in terms of safety and aquatic habitat degradation. The length of operating schedules for other activities virtually assures that cleared riparian areas or floodplain encroachments would be unprotected during the runoff season. Soil stockpiles, drilling fluids, slash piles and other materials could be washed into flood flows, thus affecting water quality, stream channel integrity and aquatic habitat.

Longer term developments in floodplains such as roads, wells and campgrounds could have a negative effect on the aquatic riparian habitat of a stream. Continual exposure to a flood risk over a period of years increases the likelihood that flood damages will occur, thus affecting human health and safety and degrading a stream environment. Consequences of facilities development in floodplains would expose hazardous materials, sewage and solid waste to flooding. Construction of living quarters or campsites in floodplains would be a risk to human safety.

Summary

Floodplains and wetlands (riparian/aquatic ecosystems) would be protected from site-specific impacts in all alternatives by implementation of the Forest Direction and riparian management guidelines established in the Forest Plan, Chapter III. Wetland protection (as required by Executive Order 11990) will be provided by ensuring that new construction of roads, campgrounds, buildings, and other facilities will not have unacceptable adverse effects on wetlands. In addition, wetland evaluation will be required prior to issuing special use permits in areas where conflicts with wetland ecosystems may occur. Specific standards and guidelines were designed to conserve riparian areas and protect floodplain values (as required by Executive Order 11988). Protective measures for riparian areas include buffer strips, stream channel stability maintenance, instream flow maintenance, and timber management that meets riparian ecosystem goals. Floodplains will be managed by locating critical facilities out of floodplains or by using structural mitigation measures (e.g., deflection structures, riprap). In cases of unresolvable conflict between riparian area dependent resources and other resource uses or developments, the riparian values will be given preferential treatment. (Reference FSM 2527, Management Prescription 9A in Chapter III of the Forest Plan).

In contrast to potential impacts approached project by project, the risk of cumulative impacts may not necessarily be mitigated by best management practices. The display of all activities and acres treated by alternative (summarized on Table II-5 and II-6) provides a relative indication of potential cumulative impacts on wetlands and floodplains. Using current direction as a basis of comparison, risk decreases in all alternatives (except A, where there is no change). It decreases only slightly in F. The least risk due to cumulative effects is associated with E because the reduced budget greatly decreases the emphasis on commodity production. Alternative C (noncommodity) is the next lowest in terms of risk for that reason, and because potential oil and gas operations would be restricted to a greater degree than in other alternatives.

Environmental Effects

On Vegetation - Management according to direction for all alternatives will maintain or improve vegetation diversity and vigor in riparian areas.

On Recreation - Direction for all alternatives will limit quantities and kinds of recreation uses and development in riparian areas. It will also enhance the quality of recreational opportunities that are available in or near such areas, including fishing, hiking, picnicing, camping and winter sports.

On Wilderness - Implementation of direction in all alternatives will provide for quality wilderness recreation. It will also provide for preservation or enhancement of wilderness resources associated with riparian areas, such as water quality, fisheries, wildlife habitat and vegetation.

On Fish, Wildlife, and Threatened or Endangered Species - Maintenance or enhancement of riparian ecosystems and wetlands in all alternatives will have a beneficial effect on fish and wildlife, including T&E species.

On Range - All alternatives would require reevaluation of range allotments. Reanalysis of suitable range will exclude wetlands from stocking level computations. Measures needed to protect wetlands could include management exclosures or other methods that permit only incidental or minor controlled use by livestock. The net effect could result in either lower stocking levels in places or increased costs of range management.

On Timber - Implementation of direction in all alternatives does not preclude timber harvest or treatments for insects and disease. It may, however, limit such activities in some particularly vulnerable areas, and it may limit or increase the expense of access to some otherwise suitable timber sources.

On Water and Wetlands - Management of water quality to protect local and downstream uses is dependent upon appropriate management of wetlands and floodplains. A similar dependence exists for maintenance of favorable conditions of flow. Direction provided in all alternatives is beneficial to the water resource.

On Minerals - Direction in all alternatives provides that no leasable minerals activities will be undertaken directly on wetlands or floodplains, subject to site-specific analysis of effects for proposed operations. Direction will limit activities on areas adjacent to wetlands or floodplains where riparian dependent resources could be adversely affected and mitigation is improbable. These limitations may or may not affect production potentials for leasables, but the expense of production could increase. Limitations are placed on locatable and saleable minerals in these areas which could increase the expense of operation and restoration.

On Lands - All land exchanges or adjustments will require a sufficient wetland and floodplain evalution as part of the environmental analysis for that action, as provided in Forest Direction (Chapter III of the Plan).

On Soils - Direction provided for all alternatives would have a beneficial effect on soil productivity and erosion control.

On Facilities - All alternatives would require wetland and floodplain analyses for proposed actions that could conceivably affect those areas. Unresolvable conflicts between such developments and wetland values will result in no action. The effect would be to locate facilities outside defined wetlands and floodplains, an action which could be more expensive in the short term. Existing facilities in floodplains, such as campgrounds, must be posted with flood hazard warnings.

MINERALS

Administration

Analyzing the environmental effects of minerals activity on a National Forest, and on the broad social and economic network tied to it, is difficult. Most Forest resources can be inventoried and regulated with comparative ease, while minerals resources are difficult to inventory. Also, regulation of mineral activity is not fully in the hands of the Forest Service.

Demand for access to National Forest System lands for the purposes of mineral exploration and development is expected to continue to increase. Most system lands are available for mineral activities, and requests for access must be processed in a timely manner. Proposals involving mineral activities are processed as prescribed by applicable laws, regulations and policies (see Chapter III, Affected Environment, Minerals section). Management requirements for minerals in the Forest Plan are based on statutory and regulatory direction for locatable, leasable and saleable minerals. Also considered are statutory and other management criteria for surface protection appropriate to the lands involved to prevent or control adverse environmental impacts.

Three categories of minerals activities are generally recognized on National Forest land: locatable, leasable, and saleable. Access roads or trails to locatable minerals operations will meet Federal environmental protection standards. These standards include those for air and water as prescribed by Federal and State laws and regulations. In addition, the plan of operation must provide for prompt reclamation or restoration of distrubed lands, to the degree practicable, for the planned uses of the area.

For leasable and saleable minerals (oil, gas, geothermal, coal, uranium, and common mineral materials) reasonable access to Forest lands is guaranteed once the discretionary decision is made to issue a lease, permit, or license which allows surface use and occupancy. The BLM issues all leases, licenses, or permits for exploratory drilling and production of valuable leasable minerals. Permits are issued by the Forest Service for initial geophysical prospecting (seismic operations for oil and gas, shallow drilling for geothermal temperature gradient measurement, and geologic investigations for solid minerals). Permits are for the land uses only and grant no rights to the permittees for the minerals involoved. The Forest Service has total discretion for disposition for common (saleable) varieties of mineral materials.

The minerals resources most likely to exert environment effects on the Forest during the planning horizon are leaseables, namely oil and gas. The administrative process involving these minerals is worth detailing.

Applications for leasable minerals are forwarded by BLM to the Forest Service for recommendations as to whether the lands are available for mineral exploration and development. Leasing criteria under Minerals in Chapter III of the Forest Plan give broad conditions for recommendations on leasing. Each application will require a more site-specific analysis. If the application is recommended by the Forest Service for issuance, stipulations necessary for the management of the surface resources are included. The set of stipulations and operating standards that the Forest Service would recommend to the BLM varies by alternative and varies by specific area within each alternative.

The variation between alternatives is due to the way alternatives were defined. In Alternatives A, B, E, and F, only stipulations and operating standards necessary to meet legal minimums (soil, water, and T&E) and protect crucial preferred winter range will be applied. In Alternatives C and D, stipulations and operating standards will be specified to protect surface resources at or above legal minimums. This might include protection or maintenance of recreation opportunities, protection of visual resources, and protection of soil, water, and wildlife at levels above what would be considered a legal minimum. Variation between specific areas within a particular alternative is due to the biophysical characteristics present and, in Alternatives C and D only, the management emphasis of the area under consideration.

Appendix E of the Forest Plan contains the specific lease stipulations available for use. Table IV-24 illustrates the application of these lease stipulations by alternative. Appendix K of the Forest Plan contains procedures for assigning surface resource protection stipulations and operating standards to all alternatives. However, those portions of Appendix K which relate to protection of recreation; visuals; and wildlife, soil, and water protection above legal minimums, should not be applied in the case of Alternatives A, B, E and F.

Recommendations for availability of lands for mineral leasing are based on whether development activities could be implemented on National Forest System lands and meet the management requirments for minerals in the Forest Plan. The mineral management requirements reflect surface resource protection and restoration requirements. Oil, gas and geothermal resource exploration and development involve the construction and use of roads, pipelines, drill pads and the ancillary facilities necessary for development, production and transportation. The major on-site physical and biological impacts of these activities are soil erosion, water pollution and air pollution.

Program Outputs

The Wilderness Act of 1964 provides that on January 1, 1984, lands designated as wilderness will be withdrawn from both location under the general mining laws and from leasing. This mineral withdrawal, subject to valid rights as of December 31, 1983, will include some lands evaluated as having moderate to high mineral potential. The Forest contains 1,379,048 acres of existing wilderness subject to this withdrawal.

Another class of land unavailable to locatable minerals development are those areas such as campground, picnic grounds, administrative sites, research natural areas and Wild and Scenic Rivers. These areas have been or will be formally withdrawn from such locatable entry (but not leasing) via an administrative and legislative process designed to protect improvements, needed administrative sites, and unique natural features. This pattern of wilderness and withdrawn land is the same for each alternative of this Forest Plan.

Saleable minerals, such as gravel, have historically exerted only small impacts on the resources of the National Forests. This class of minerals development is not usually excluded from nonwilderness lands as a matter of management direction. The acres available for this class of activity is, then, a fixed consideration for all the Forest Plan alternatives.

The most significant class of minerals activity on the Shoshone National Forest is leasables, especially oil and gas. National direction for the management of wilderness study areas such as the Dunoir and High Lakes is to recommend against or deny consent to lease until Congress acts on disposition as wilderness or releases them from consideration.

TABLE IV-24

Possible Surface Resource Protection Stipulations By Alternative

	Stipulations[1]							
Alternative	3109-3	B[2]	C[2]	D[2]	E[2]	F[2]	G[2]	H[2]
A	yes	yes	yes	yes	yes	yes	yes	yes
B	yes	yes	yes	yes	yes	yes	yes	yes
C	yes	yes	yes[3]	yes[3]	yes	yes[3]	yes[3]	no
D	yes	yes	yes[3]	yes[3]	yes	yes[3]	yes[3]	no
E	yes	yes	yes	yes	yes	yes	yes	yes
F	yes	yes	yes	yes	yes	yes	yes	yes

1/ Keywords identifying the various stipulations are as follows:

3109-3 = general
B = classified areas
C = special purposes/seasonal restrictions
D = soil, water, and T&E
E = Wild and Scenic Rivers
F = no surface occupancy
G = activity coordination
H = conditional no-surface-occupancy

2/ entries of "yes" apply only if biophysical characteristics relating to soil, water, T&E, or crucial preferred wildlife winter range protection minimums are present in the area covered by the lease application.

3/ in these cases, entries of "yes" can be applied to provide protection over and above what would be considered minimums for soil, water, T&E, and crucial preferred wildlife winter range based on the management emphasis in the area covered by the lease application.

Each alternative includes the directive that lease applications in all grizzly bear essential habitat (grizzly bear Management Situation I) outside of wilderness be given negative recommendations or consent denials. This action is specified in the EA for Oil and Gas Leasing in Grizzly Bear Management Situations 1 and 2, Shoshone National Forest (1982), incorporated by reference into Chapter III of the Forest Plan. Refer to Chapter VI (Volume II), response to comment 68-8, for a discussion of lease denial in Situation I.

In summary, locatable, leaseable and saleable minerals are constrained on a quantitative (i.e., acreage) basis to the same extent in each alternative. The fact that every alternative displays the same acreage (935,000) as available for oil and gas leasing, does not mean that the management of this class of minerals activity would be the same in all alternatives. As described in Appendix K of the Forest Plan and in the MINERALS Administration section above, every lease application on Forest land is reported to the Bureau of Land Management with attached stipulations tailored to be responsive to the biophysical characteristics and, in the case of Alternatives C and D, the management direction for the analysis area involved. This selection of lease stipulations is based on the specific lease tract being applied for. The acres estimated to be available for leasing were determined as shown in Table IV-25.

TABLE IV-25

Estimation of Acres Available for Oil and Gas Leasing

ACRES NOT AVAILABLE FOR LEASING		
Designated Wilderness*	1,379,048	
Wilderness Study Area**	14,700	
Dunoir Special Area**	28,987	
Grizzly Bear Situation I outside Wilderness**	66,650	
Wild and Scenic River**	6,660	
Research Natural Areas*	1,680	
Beartooth Highway Withdrawal*	410	
Total	1,498,135	1,498,135
ACRES AVAILABLE FOR LEASING		934,990
TOTAL FOREST ACRES		2,433,125

* Legislatively withdrawn from oil and gas leasing.
** Forest Service recommends No Lease to Bureau of Land Management.

Environmental Effects

Because minerals activities are difficult to predict, both in type and intensity, only a general analysis of possible impacts are possible short of site-specific analysis. It may be assumed that the environmental effects will be fairly uniform in alternatives A, B, E and F, where soil, water, threatened and endangered species, and crucial preferred wildlife winter range are protected by legal minimum standards. In Alternatives C and D recreation and visual resources also receive protection and soil, water, and wildlife resources generally receive protection above legal minimums.

On Vegetation - Mineral exploration and development would result in disturbance of vegetation under all alternatives. In the case of development, some vegetation would be removed for a period of 50 or more years. Hardrock mining could alter the existing soil environment enough to permanently alter the potential vegetative cover.

For exploration and unsuccessful exploratory drilling, significant short-term impacts to the vegetation would occur on the immediate sites where the exploration activity takes place. Depending on the extent of disturbance and the vegetative community in which it occurs, these impacts would last from five to forty years or longer. Site potential could be restored to natural or near natural levels on sites identified in the Forest plan as lands suitable for surface occupancy.

On Recreation - Managing areas for semiprimitive motorized, nonmotorized and dispersed recreation may foster conflicts by bringing visitors into contact with mineral activities. Such contacts may be abrupt and could generate negative feelings about authorized mineral resource uses. The principal effect on recreation, particularly in the semiprimitive setting, results from the density and scale of the road systems authorized.

On Visual Resources - In Alternatives C and D strong emphasis is placed on maintaining visual quality in all phases of mineral development which require ground disturbance. This is achieved by requiring such measures as vegetation screens, dispersed or buried facilities, and unobtrusive structures. In Alternatives A, B, E, and F there are no required restrictions on mineral operations due to visual concerns. This will result in significant reductions in visual quality during development and operation in some areas.

On Cultural Resources - Before mineral activity occurs, an on-site cultural survey would be performed. When a discovery is made or a site is located, information would be recorded and mitigation planned. Strip mine activities would destroy cultural sites, but not until data or artifacts are retrieved. Discovery of important cultural or historic sites would require extensive mitigation or relocation of planned facilities. Uniques areas would be withdrawn from mineral development.

On Wilderness - Should operations be approved in wilderness (only for leases and claims valid as of December 31, 1983), there would be impacts on a variety of wilderness characteristics and on the Congressional mandate that these areas are to be managed so that man and his impacts are transient and temporary in nature.

On Wildlife - The long-term effects on wildlife forage are the same as the effects on domestic livestock range (see On Range below). Wildlife that require security away from human activity would be displaced to adjacent territories already occupied or of lesser quality in the short term. The result would be a loss of some individuals within the local community or excessive utilization of forage in those areas that are at existing capacities. An increase in accidental kills and poaching could occur in areas of increased roading and human activity. In important wildlife winter ranges, the effects on wildlife are mitigated by the requirements shown in Chapter III of the Forest Plan. In Alternatives A, B, E, and F, restrictions on oil and gas operations are for meeting legal minimum standards for soil, water, and threatened and endangered species; restrictions are also for protecting crucial preferred winter range. In these alternatives there is a likelihood of significant detrimental effects on other wildlife species, particularly elk and bighorn sheep. These impacts might include displacement on noncrucial winter range and disturbance during critical times such as birthing. In Alternatives C and D, restrictions on operations are included which will protect wildlife as appropriate to deal with specific situations.

On Fish - The effects of mineral exploration on fish habit and populations for all alternatives would depend on the location of mineral activity relative to lakes and streams. The risk of degradation to fisheries listed from highest to lowest occurs in Alternatives B, F, A, E, D, and C. (See also effects on Water, Wetlands and Floodplains.)

On Threatened and Endangered Species - As displayed in Chapter III, Forest Plan, when a site-specific analysis indicates that a threatened or endangered species could be seriously impacted by any oil and gas leasing activity, the Forest Service will recommend against issuance of mineral leases. Based on two previous environmental analyses, a decision has been made to recommend lease denial in all nonwilderness grizzly bear Management Situation I areas (except for a one half mile zone along the interior boundary which may be leased on a case-by-case basis with a no-surface-occupancy stipulation). These actions will prevent any significant effects on any threatened or endangered species.

On Range - Mineral exploration and development would affect rangeland under all alternatives only to the extent that site specific vegetation would be removed. In the long term, since these areas would be restored following creation of mineral activities, there would be no permanent reductions in forage production. Range vegetation would be restored to a condition equal to or better than that of predisturbance levels.

The amount of permanent access roads to developments would reduce available forage for livestock. Seeding of the road cuts, fills and barrow pits with species of palatable livestock forage would cause the reduction to be insignificant. In various range types increases in the amount of forage available for livestock could be realized.

On Timber - As roads are built for access for mineral development, they may increase access to tentatively suitable timberland. In general, there would be no significant effect of minerals development on the timber program.

On Water, Wetlands and Floodplains - Under all alternatives, mining activities would produce mine wastewater, mill tailings, waste liquids and soil stockpiles and other potential sources of pollution. Such substances would reduce water quality if introduced into surface or subsurface water. Strict controls on these substances, as well as proper location of mines, oil wells and facilities, would mitigate potential water quality problems. During abandonment, reclamation measures would include filling, contouring and revegetating to control soil erosion and to avoid contamination of the watershed.

Under all alternatives, mineral activity effects on floodplains and wetlands could be substantial. Most streams on the Forest are enclosed in narrow valleys. In most cases, the riparian area and floodplain together comprise the entire width of the valley bottom which grades rapidly into colluvial sideslopes or near-vertical rock walls. Where mineral activities occur in floodplains or riparian wetlands, effects on water quality or stream channel stability would be immediate and significant. Physiographic and hydrologic conditions relating to how precipitation is converted into streamflow can be drastically altered by roads and well sites. Such effects can be mitigated for most exploratory activities, but development and production to the degree existing east of the Forest would be unmitigable. Direction for minerals activities in relation to water quality and riparian/aquatic ecosystems is found in Plan Chapter III, Minerals Area Management, Riparian Area Management, and Water Resource Improvement and Maintenance.

About 40 percent of the Forest is presently available for oil and gas leasing. Of these leasable lands, forestwide, about 50 percent are poorly suited for surface occupancy based on interpretations for watershed values using landtype characteristics. On the Greybull district, much of which has high or moderate potential for oil and gas discovery, nearly 70 percent of the leasable land is poorly suited for surface occupancy. The suitability interpretation is based upon an analysis of landtypes present in an area with regard to a number of characteristics. These include: restoration potential, revegetation potential, soil erosion potential, slope stability, and water and sediment delivery efficiency. This analysis is contained in the Forest's planning records. Because of the mapping scale of the landtype units, areas of high or moderate suitability for surface occupancy may be present within areas of poor suitability, and conversely. It is also true, however, that some mapped units of high of moderate suitability for surface occupancy are surrounded by poor suitability landtypes. Access to these areas for development or production of oil and gas would involve a significant potential for negative effects on water quality. Present lack of actual water quality data in relation to Forest management activities prevents a determination of the extent or severity of potential effects, locally or cumulatively. Actual consequences would be predicated on the acceptance, rejection, or modification of leases or operating plans in areas of poor suitability by the BLM, following a Forest Service recommendation of no-surface-occupancy.

The actual effects on water quality are contingent upon the proximity of roads, pads, and support facilities to surface water, and measures which are used for pollution control. Specifically, road and pad construction can introduce sediment and various nutrients into streams; drainage from these facilities can introduce other pollutants, notably oil and grease. The drilling process can degrade shallow subsurface water and surface water recharge through insufficient well casing and leaching through or failure of reserve pits. Substances of concern from these sources include chromium compounds, oil and grease, chlorides, dissolved solids and sediment (suspended solids), all of which can be toxic or harmful to fish, humans, and wildlife. Support facilities such as barracks, storage tanks, waste disposal sites, toilets, and pipelines can introduce a variety of both harmful and nuisance substances into streams. Pipeline leaks, which occur routinely in developed fields, are a great concern during production. Pipelines can be subjected to a variety of destructive forces: rapid downslope movement of snow and rock, floods, erosion, soil creep and frost heaving on steep slopes. These forces insert a degree of unpredictability and a potential for massive spills due to pipeline breakage.

The introduction of substances listed above will produce on and off-site impacts on various water uses. Specific impacts on water quality in either instance would include temperature changes, changes in pH, and reduced buffering capacity in the stream, which relates to fluctuations in pH. These changes, along with additional nutrient inputs, would encourage changes in the aquatic community that are not conducive to aesthetics and may not be beneficial to fish presently inhabiting the streams. Sediment, the primary substance of concern, will degrade fish habitat. Sedimentation damages water conveyance facilities and reduces the water holding capacity of reservoirs. Turbidity, which is an optical property of suspended sediment, has been shown to reduce the effectiveness of water treatment by chlorination, and detracts from stream aesthetics. Chromium is toxic to man in certain forms and quantities. Oil and grease is toxic to fish and wildlife in certain quantities, and causes taste, odor, and appearance problems in public water supplies. These same characteristics of odor and appearance detract from water used for recreational and aesthetic enjoyment. Chlorides are objectionable in water supplies on the basis of taste, and high concentrations will corrode water utility fixtures. Dissolved solids in high concentrations reduce the palatability of water, can cause physiological effects in water consumers, and in some instances, produces saline conditions that render water unsuitable for irrigation use (U.S. EPA Water Quality Criteria, 1972).

Increased human activities near streams will introduce floating solids (e.g., cans, bottles, refuse) that detract from aesthetics. Human waste from development near streams has the potential to introduce biologic pollutants such as bacteria, viruses, and protozoa. Man's activity, in association with dogs and various species of wildlife, has been shown to increase the incidence of Giardia (spp.), a protozoa, in natural waters. Public water supplies are greatly threatened by such an increase (Williams, O.R., 1981).

The most significant potential point source impact on surface water quality comes from oil spills which generally occur when petroleum products are in transit, but may also occur as blowouts during exploratory drilling and development. Reported oil spills within the BLM Cody Resource Area between 1976 and 1981 ranged in size from 3,000 to less than 5 barrels. There was an average of one reported oil spill every three years in each field development. Although no significant lasting environmental impacts were associated with these spills, the possibility exists for a major spill with lasting effects (North Fork Well Draft EIS, 1984). Most of the Shoshone National Forest is characterized by geology, terrain, climate and stream density much more severe than the adjacent BLM lands in terms of spill hazard. Periodic mass movement due to storm runoff and avalanches is common in some areas. Most bottomlands are subject to flood hazards. Under these conditions, it is expected that with field development similar to that in the Cody Resource Area the incidence and severity of spills would exceed that which is reported above.

The potential effects of oil and gas activities on water quality, wetlands and floodplains would be reduced in Alternatives C and D. Recommended limitations in operating plans could be applied to reduce well densities and provide for leasing without surface occupancy in selected areas. The risk of cumulative effects of oil and gas pads, access and service roads, and (potential) spills of hazardous materials would be much lower than at present under Alternative C, lower under D, and the same in all others.

On Groundwater - Pre-exploratory drilling and blasting adjacent to stream channels could temporarily affect the quality of shallow groundwater that recharges surface flows in streams. It is possible that blasting immediately above spring flow could interrupt that flow temporarily but it is unlikely that long-term effects would occur. Holes contacting artesian aquifers that are not adequatelly plugged could create surface water and result in gulleying or other problems associated with perennially wet soils. The effects of blasting on water bearing formations is expected to be of short duration and low intensity. There are no documented instances of disruption or impedance of groundwater flows due to seismic operations. It is conceivable that blasting will occur in or immediately above shallow water deposits lying in the valley bottoms or lower slopes. Narrow lenses of water could be disrupted by such blasting, changing the seepage location of a spring or requiring the redrilling of a well. Blasting in or near alluvial deposits would not be expected to alter subsurface flow characteristics in those areas. Shallow drilling in recharge areas for central basin aquifers (outcrops of the Madison and Tensleep formations) is not expected to affect groundwater quality for lack of a significant pollution source. If anything, the percolation of water into the structure from the soil water table could be increased.

The primary concern with drilling activities involves striking several water bearing formations; deeper water of low quality may be driven up the hole under pressure and contaminate water in overlying structures. On the Forest, holes would have to be greater than 1000 feet deep, and usually much deeper, in order to intercept more than one structure. Exploratory wells are expected to probe to depths of 5000 feet or more. The implementation of regulatory practices for cementing water bearing zones, for surface casing and for sealing reserve pits and capping well holes will diminish the potential for cross contamination and for surface problems. All such practices will be formulated and applied using DEQ rules and regulations, as well as Wyoming Oil and Gas Conservation Commission guides.

There is no known or suspected link between subsurface water structures beneath nonwilderness portions of the Forest and geothermal resources in Yellowstone National Park. Deep drilling on the Forest would not be expected to affect those resources.

On Minerals - Extraction of mineral resources would result in an irretrievable loss of these resources from the site.

On Soils - Impacts would be expected to occur under all alternatives as a result of exploration and development activities related to oil and gas and other mineral activity. Oil and gas exploration and development could occur on all forest lands available for leasing. However, oil and gas activity would be very restricted in terms of where, how and how much on lands designated "high" soil and water hazard. On all lands, a site specific environmental analysis would be conducted for the purpose of ensuring adequate protection of the environment. Implementation of standards and guidelines contained in Forest Direction (and other sources incorporated by reference) would limit the impact of such activities to an acceptable level.

On Facilities - Mineral activities generate a need for other facilities such as new or reconstructed roads, powerlines and structures. Roads service mineral resource facilities. Increased use of the road system would occur as a result of mineral activities, and this would result in increased road management activities in order to accommodate all uses of the road system. Increased transportation planning is needed when increased minerals activities occur. The net effect of minerals activities on roads would be an expansion and upgrading of existing road systems.

Industry, the Bureau of Land Management and the Forest Service would cooperate in the location and development of utility corridors so that physical and biological effects are controlled.

As areas are developed for minerals, increased use of water and waste collection systems would occur. In previously undeveloped areas, a need for new systems would occur because of increased water use and increased amounts of solid and sanitary waste.

On Fire - Workers and equipment associated with mineral activity would increase the potential for man-caused wildfires in the short term. The effect would be mitigated by early detection and suppression, and the risk would be reduced when operations are completed.

On Air - The Regional Forester is responsible for analyzing air pollution impacts on air quality related values for those sources subject to the Prevention of Significant Deterioration (PSD) regulations (Clean Air Act of 1977, as amended). This analysis would include a determination of impacts on visibility. It is highly unlikely that any source would be developed within a wilderness that would be subject to PSD.

Air pollution impacts likely to occur from minerals-related activities include the following:

- Fugitive dust from unpaved roads, exposed areas, drilling and blasting, stockpiles and waste piles, loading and hauling, and mechanical disturbance.

- Odors from vehicle emissions, fuel storage, leaks in equipment, and emergency venting.

- Ambient air pollutants (other than dust), PSD pollutants, acid precipitation, and acid deposition from fugitive and vented emissions of gas sweetening plants, chemical processing plants, petroleum storage units, refineries, and smelters.

Other air pollution sources affecting wilderness areas will be required to use Best Available Control Technology (BACT). BACT determinations include a review of environmental impacts. In areas that have special environmental characteristics (such as wilderness or natural areas), the Forest Service can require strict mitigation measures through early involvement in the PSD permitting process. The determination of BACT will be done in a site specific analysis for individaul operating plans. State air quality regulating authorities and EPA will be consulted in determining BACT.

Road construction and use, pad construction, and drilling exploration wells on the Forest have the potential to create a concentration of airborne particles and gases that are vented from the drill site. Emissions from internal combustion engines and motorized equipment could add to the particulate load and noxious gas contents in air. Such concentrations would not be present long enough to adversely affect air quality over the long term.

During development and production, traffic on roads and in the vicinity of pads will produce significant quantities of particulate matter (including dust) and gases from internal combustion engines. A producing field containing tank facilities, gas separation facilities, diesel pumps, etc., will produce odors due to venting of gases and other emissions. In the production phase, air pollutants such as carbon monoxide, hydrocarbons, nitrogen oxides, sulphur oxides and hydrogen sulfide are produced: in separation facilities; during disposal of liquid waste and unwanted gas; by burning of waste petroleum products; by emission of objectionable odors; and by venting of noxious vapors from storage tanks. Accidental explosions, fire, blowouts, oil spills, and leaks can occur causing potentially serious air pollution problems.

The release of large volumes of hydrogen sulfide (or sour gas) into the atmosphere would have severe effects on persons or wildlife in the immediate vicinity. A massive well blowout in an enclosed basin could be fatal to wildlife, oil field personnel, and hikers or campers who happen to be in the presence of high concentrations of the toxic gas. In lower concentrations, after mixing and dilution in the atmosphere, the presence of sour gas is evident by to its noxious odor.

Oil fields immediately to the east of the Forest have encountered sour gas in the deeper geologic formations, below the cretaceous levels. Precise figures are not available at present regarding quantities of the gas. However, they are not sufficiently large enough to justify treatment other than venting. Determining the probability of producing sour gas in wells located within the Forest is dependent upon knowledge of distribution of the gas, well location, and depth of well. Without this information, it is assumed that sour gas would occur to about the same degree as in the area to the east.

If development and production occurs over a long period of time adjacent to wilderness, some or all of the air quality-related values of odor, visibility, vegetation, soil and water could be affected. Residuals of noxious, odor-producing gases may remain in stagnant air pockets; effects on vegetation may be apparent by reduced vigor and ability to withstand disease-producing organisms; settling of pollutants onto soil or surface water can change the chemical characteristics of those resources, thus affecting soil and aquatic ecosystems. Such effects depend upon local meteorologic trends that have not been evaluated as yet.

Before any oil and gas development activities can begin on leased lands, the lease holder must submit a proposed operating plan to the Forest Service for review and approval. During the review, the Forest Service will determine if air pollution resulting from activities on federal land will comply with the applicable State Implementation Plan (Section 176[c], Clear Air Act of 1977, as amended). General Direction for Air Resource Management under all alternatives is found in Chapter III of the Plan.

On Timber - Land use would change from forestry to mineral development emphasis during development and would return to forestry emphasis after reclamation. Timberland would be taken out of production when mining occurs and later restored to pre-mining levels.

Perhaps the most significant impact minerals development could have on the timber resource is the effect of increased roading, especially in previously unroaded areas. Timber whose value could not justify roading and harvest on its own merits may well become practical to harvest when a minerals-related access road is constructed. This impact can be considered as either positive or negative depending on the circumstances and values of the observer.

On Human and Community Development - All minerals activities possess the potential to affect human and community conditions to one degree or another. It is the responsibility of the Forest Service and Bureau of Land Management to properly assess this impact when a minerals activity is proposed on Federal land. The impacts of greatest concern are related to economic impacts, lifestyle modifications, and conflicts with the value systems of the local, regional and national publics.

Seismic activities can generate loss of recreational experience quality via noise and visual disruption. It can have impacts far from the immediate site of geophysical operations. Seismic related road use can impact the same features.

Large scale mining, and oil and gas well development can have profound impacts, both positive and negative, on regional communities. These impacts are generated via population changes, economic changes and lifestyle alterations. An extreme case is the "boom town" syndrome experienced by some western communities. Other impacts can be favorable, such as providing an enhanced tax base for local communities and a source of employment.

As explained throughout this section, the eventual extent of any minerals activity is nearly impossible to predict prior to discovery. For this reason, the analysis of effects must usually be a site-specific analysis performed when a discovery is made.

HUMAN AND COMMUNITY DEVELOPMENT

The human and community development program includes activities such as providing work opportunities for volunteers and employment programs.

Program Outputs

Human and community development programs are affected by budget restrictions rather than resource management alternatives; therefore, the effects are estimated to be similar for all alternatives. The Forest would administer those programs for which funding is available. Under all alternatives, the Forest would continue to conduct the Volunteers in National Forests program that provides opportunities for people to contribute their talents and knowledge to enhance Forest Service activities. The Forest would also participate in cooperative programs administered by state and local governments.

Environmental Effects

The human and community development program would not affect physical and biological factors on the Forest, except that increased volunteer help would increase the need for facilities. This would occur under all alternatives in proportion to the volunteer program.

LANDS

The lands program includes activities such as land purchase, land disposal, land exchange, special use administration, acquisition of rights-of-way, and the surveying program for landline location.

Program Outputs

Under all alternatives, there would be permitted special uses of the Forest. Most of these uses would involve relatively small land areas and would have minimal environmental effects. Some special uses would involve larger land areas and would have substantial environmental effects. Environmental analyses will be conducted when any special use is proposed on the Forest. Because it is not possible to predict the special uses that might be proposed under each alternative, environmental effects are not predicted in this analysis. They will be disclosed on a site-specific basis when proposals are analyzed.

The emphasis of each alternative would directly influence lands-related actions. As commodity outputs increase, the need for support from the lands program is also likely to increase. The Forest's land aquisition and land exchange needs have been historically limited because of the relatively small amounts of private lands inside the Forest boundary. It is anticipated this will remain true under any of the alternatives considered.

Land purchase, acquisition and exchange programs would be relatively consistent for all alternatives except E. All alternatives would have a lands program schedule consistent with the Regional Guide and designed to complete priority purchases and acquisitions by the end of the planning horizon. Alternative E would have no program in land purchase or acquisition.

The right-of-way acquisition program would have between three and eight acquisitions for all alternatives except E. The program for each alternative would be commensurate with the road and trail construction/reconstruction needs within each alternative. (The 1980 level is five priority acquisitions annually to meet minimum program requirements.)

The surveying, marking and posting of land-lines results in the identification and inventory of occupancy trespass encroachments on National Forest lands. This is a relatively small problem on the Shoshone National Forest. The land line surveying program is expected to remain constant in each of the alternatives except E.

Alternatives would not affect utility corridors. Existing and future considerations of utility corridors come from industry demands for electric transmission lines, communications lines and microwave sites. The demand for energy production would control the continued need for pipelines for the transmission of coal, oil and gas regardless of the selected alternative.

The expansion of existing utility corridors and the addition of others would be necessary to accommodate the demand for utilities in all areas of the Forest. Construction of new transportation and utility facilities would be needed to meet increasing demands and to accommodate future needs not anticipated at the time of plan preparation.

Environmental Effects

The land purchase, acquisition and exchange program has the potential to add selected lands to the resource base for any of the Forest program: recreation, wilderness, research natural areas, wildlife and fish habitat, range, timber, water or minerals. This effect would occur by alternative in proportion to the number of acquisitions since it is not possible to predict what parcels would be acquired or exchanged, the actual effect on the various resource bases is not estimated.

On Visual Resources - Utility corridor location (part of the lands program) would affect visual quality by introducing line patterns on the landscape. Landscape character would be changed when corridors are perpendicular to slopes. This effect would not vary by alternative, and would be mitigated by Forest Direction. (See Visual Resource Management of the Forest Plan).

On Wildlife and Threatened or Endangered Species - Overhead power transmission lines would provide resting places for raptors but also would increase the potential for electrocution of eagles and other large raptors. This effect would be mitigated by Forest Direction. (See Special Use Management General Direction of the Forest Plan.)

On Timber - Some of the tentatively suitable timberland does not have public access. Acquisition of rights-of-way will be necessary in all alternatives except Alternative E.

SOILS

The soils program includes activities such as soil survey, soil productivity studies, long range planning, soil monitoring, watershed condition surveys, project plan development and implemention of watershed projects.

Major effects on the soil resources are tied directly to vegetation treatment, road construction, facility development, grazing systems, mineral exploration and development and concentrated use of recreation sites. The soil program is necessary to inventory, evaluate and determine baseline soil resource values for implementing the proper protection and use of the soil resource. The soil program evaluates proposed management activities, prescribes adequate mitigation measures where necessary and designs rehabilitation projects when problems occur.

Soil programs affecting other resources include soil monitoring and watershed projects. These add to indirect costs of other programs such as wildlife, timber and fire.

Program Outputs

Completion of a soil survey of the total forest acres at a level of detail commensurate with Forest management would occur under all alternatives. Soil monitoring would occur to 1) establish base line soil resource values, and 2) measure the effects of management on these baseline values. The main thrust of monitoring is to determine soil/site productivity and the effects of management. Watershed condition inventories and project investigation/planning would also occur under all alternatives. Alternatives, A, B, D and F apply nearly equal emphasis on soil program needs while Alternatives C and E place much less emphasis on the need for monitoring.

Table IV-26 illustrates the estimated annual increase in erosion resulting from a variety of forest management activities, by alternative. Indices used to estimate these increases include timber harvest acres and treatments, grazing, and levels of other vegetation management practices.

TABLE IV-26

Estimated Erosion Increases in Thousands of Tons* (Average Annual)

		Alternative					
		A	B	C	D	E	F
	Existing	Current Direction	Commodity Emphasis	Non-Commodity Emphasis	Proposed	Reduced Budget	RPA
Erosion Increase	399	385	338	177	322	76	330

*Natural erosion is estimated to be 24 million tons/year.

Activities related to watershed condition surveys, and project planning and implementation are the basis for analysis of "water meeting quality goals". This output is reported in the Water Resource program discussion. Increases in water meeting quality goals are tied to acres of improved watershed condition over time. The assumptions used to quantify water quality improvement therefore apply here as well. Table IV-27 illustrates watershed condition improvement, which is contingent upon the assumption that such improvement is a minimum acceptable standard under the authority of RPA.

The acres reported in the Table IV-27 relate to the total estimated watershed condition that would benefit from site-specific treatments (see soils in Chapter III). Site-specific treatments currently inventoried amount to 900 acres in declining condition and 1500 acres in stable but unsatisfactory condition. The inventory is about 40 percent complete.

TABLE IV-27

Watershed Condition Improvement under All Alternatives

	Planning Period				
	1	2	3	4	5
Improved Condition (MAcres)	0	67.1	134.	201.	201.
Thousands of Acres Treated each Period	67.1	66.9	67.	0	0
Cumulative Acres Treated* (MAcres)	67.1	134.	201.	201.	201.

*Treatment includes delayed timber harvest, road closures, reduced cattle stocking, etc. Nonpoint source problems are being addressed, hence the large acreages shown above.

Environmental Effects

On Visual Resources - There are no significant adverse effects on the visual resources from the soils program. The program, when carried out as intended, is one of the principal contributors to the protection and enhancement of the visual quality of the Forest.

On Cultural Resources - There are no adverse effects. The implementation of the soils program offers increased opportunities to discover artifacts and document effects of geologic and historic events on the Forest.

On Wilderness - There are no adverse effects. The soils program, in conjunction with ecological inventories, provides much needed baseline data which is essential to determining "levels of acceptable use" for other resource activities within the wildernesses.

On Fish and Wildlife - Improvement of wildlife and fish habitat will be the same in all alternatives. Decreased sedimentation into the streams will improve spawning areas and decrease stream bank erosion. Increased forage will be available for wildlife use on rehabilitated areas. The amount of fish and wildlife habitat improved is determined by the timing of the rehabilitation program by alternative by planning periods.

On Range - The effects on range will be the same for all alternatives. As soils are improved, livestock forage will be increased. The timing of the soil rehabilitation program will determine the amount of forage increase by alternative by planning periods.

On Timber - Standards for maintaining soil productivity were considered in determining lands tentatively suitable for timber production. Beyond this, such standards affect sale layout and costs of operations. No significant effect on harvest volumes result from soil constraints.

On Water and Wetlands - Maintenance of site productivity, erosion control and efforts to improve watershed condition will have a positive effect on water quality and maintenance of wetlands. Some short-term effects on water quality could result from implementation of projects to improve stream channel stability.

On Soils - That portion of the soils program which is a support function to other programs, such as timber, range or wildlife, fluctuates in cost by alternative. Costs are highest in Alternative B where commodity outputs are emphasized and lower in Alternative C where noncommodity outputs are emphasized. Soil program costs are lowest for Alternative E (reduced budget). Soil monitoring costs fluctuate from a high of about $80,000 per decade for Alternative A to $30,000 per decade under Alternative C.

Natural erosion has been estimated to occur at a rate of 24 million tons per year. Natural erosion takes place through natural land forming process on lands undisturbed by man. Accelerated erosion is that which occurs because of man's activities and is above and beyond the erosion that would occur naturally. As would be expected, the analysis of alternatives indicates that accelerated erosion increases in those alternatives where timber and range activities are highest. Alternative A results in the highest estimated accelerated erosion of 385,000 tons per year. This is an absolute increase in erosion of about 1.6 percent above natural. Alternative D results in an estimated accelerated erosion increase of 322,000 tons per year (1.3 percent increase). Alternative C results in an estimated increase of 177,000 tons per year (0.7 percent increase), while Alternative E would produce an estimated 76,000 tons per year (0.3 percent increase). Most accelerated erosion results from road, skid trail and landing construction in the timber program and from grazing.

A Third Order Soil Survey began on the Forest in 1979 and was suspended in 1982. Approximately one half of the Forest acres have been completed. All alternatives plan for the resumption of the soil survey according to Regional Soil Program direction.

Soil compaction due to heavy equipment use on moist, fine textured soils would affect soil productivity under all alternatives. Soils with high and moderate compaction hazards have been identified. Prescriptions on these land areas include provisions for mitigating the effects. Best management practices listed in Chapter III of the Plan also account for soil areas with high or moderate compaction hazards. Monitoring costs increase for alternatives prescribing timber management on such lands.

FACILITIES

The facilities program includes activities such as maintenance, construction and reconstruction of roads, trails and structures (i.e. water storage and transportation projects, wells and sanitary facilities, campgrounds, visitor information centers, etc.)

Program Outputs

Roads and trails will be constructed or reconstructed under all alternatives to meet recreation and timber goals and objectives. Road closure, road obliteration and road control also occurs under all alternatives. Generally, alternatives with the highest level of trail or road construction also have the highest maintenance costs.

Road construction/reconstruction is greatest for Alternative A (Current) and least for Alternative E (Reduced Budget). Average annual road construction/reconstruction estimates range from 13.6 miles in the first five decades of Alternative A to 2.6 miles for Alternative E. Similarly, road maintenance costs are highest in Alternative A and lowest in C; cost is a function of total road miles in the system.

Trail construction/reconstruction is greatest for Alternatives A (Current), D (Preferred), and F (RPA) reflecting an emphasis on recreation. Trail construction is least for Alternative E (Reduced Budget). The estimated miles of trail construction/reconstruction ranges from a high of 151 miles to a low of 68 miles in the next 50 years. Trail maintenance (existing and proposed construction) is highest in Alternatives A, C and D, in which the largest trail systems are proposed.

The road and trail systems proposed under the various alternatives would be managed through traffic regulation. Travel management consists of closing roads and trails seasonally or yearlong to prevent resource damage, wildlife disturbance, safety hazards and to reduce maintenance costs. Some roads are projected to be closed, others are to remain open or be controlled (i.e. seasonal restrictions, vehicle restrictions, etc.).

Approximately 940 miles of road would be open under Alternative A during the first decade and the number of miles would gradually decrease to 660 miles by the end of the 50 year period. Under Alternative E, 500 miles would be open to public use during the first decade and gradually decrease to 465 miles open at the end of the 50 year period. The most miles of open roads at the end of the planning horizon would occur under Alternative F, while the most miles of closed roads would occur under Alternatives A and D. See Tables II-5 and VI-6 for other comparisons that can be made regarding open, closed, and controlled roads.

The need for all existing work centers, back country cabins, ranger stations, guard stations, fire control facilities, visitor information centers/sites and communication sites would remain the same under all alternatives. No new structures are planned under any alternative for the 50 year period. Construction, reconstruction, and maintenance varies by alternative. Alternatives A, B, and F would have the highest cost over the 50 year planning period while Alternative E would have the lowest.

Environmental Effects

On Recreation - The road and trail program has perhaps the single most significant effect on the kind, amount and quality of the dispersed recreation opportunities available on the Forest. Unmanaged and unplanned, the building and management of roads can destroy the opportunities for nonmotorized recreation activities outside wilderness and can greatly reduce the quality of the motorized recreation opportunities. The standards and guidelines contained in Forest Direction and Management Area Prescriptions regarding the construction, maintenance and management of roads are designed to provide an adequate and appropriate Forest transportation system in each alternative.

Seasonal road closures may inconvenience the public. These closures are proposed under all alternatives in order to mitigate the adverse effects of motorized vehical use on other resources.

On Visual Resources - Failure to follow visual management guidelines in the location and construction of roads and trails or the failure to properly maintain existing facilities can have a significant adverse effect on the visual quality of the Forest. Adherence to the standards and guidelines contained in Forest Direction and Management Area Prescriptions will minimize the visual impact of the road and trail system and in places enhance the enjoyment of the forest landscapes by visitors.

On Cultural Resources - Road and trail construction and reconstruction can damage or destroy cultural resources. Increased public use of areas which is induced by roads and trails tends to increase the risk of damage or loss of these resources through collecting and vandalism. Cultural resource surveys conducted prior to road and trail construction or reconstruction will mitigate these adverse effects under all alternatives.

On Wilderness - Wilderness visitor use will increase over time in all alternatives. Increased use may require additional trail mileage to help disperse users and protect the wilderness resource. Trails will require timely maintainence and in some cases relocation or reconstruction to meet the goals of wilderness protection. This is especially true in areas receiving heavy recreation stock use. Alternative E is the most likely to result in deterioration of the wilderness trail system and a subsequent reduction in the quality of the wilderness experience. Management standards apply to E as well as the other alternatives, but implementation is less likely due to funding constraints.

On Fish and Wildlife - Roads and trails permit easier access for hunting, fishing and other wildlife oriented recreation. Motorized vehicle use is expected to limit the effective use of wildlife habitat by many species. The existence of roads also increases the potential for stream sedimentation which degrades fish habitat. These effects will be greatest in those alternatives which propose the most vegetation treatment requiring roads. This effect would occur in proportion to the road and trail construction reported in Tables II-5 and II-6. In all alternatives, the effects on wildlife habitat will be mitigated by retaining hiding cover along arterial and collector roads, and by imposing seasonal road closures. This mitigation is described in the Wildlife Habitat Improvement and Maintenance and the Transportation System Management activities in Forest Direction, and in prescriptions for all management areas where roads exist. The effects on fish habitat will be mitigated by limiting sediment yields as discussed in Water Resource Improvement and Maintenance Management Activity in Forest Direction.

Public use of roads and trails and off-road vehicle use in winter big game habitat during winter can severely reduce the effective use of this habitat.

Snowmobiling can harass wildlife. These effects will be potentially severe in all alternatives. Because of a limited amount of available winter range, harassment from motorized vehicle use would be most critical. By the end of the planning horizon the percentage of roads open or controlled is greatest in Alternatives A and D and least in C. Alternative E has the fewest roads and the fewest miles open or controlled.

On Threatened and Endangered Species - Human activities associated with construction, maintenance and use of roads and other facilities have the potential for increasing losses of food, cover and habitat security. The grizzly bear presents the greatest opportunity for such adverse effects. The potential for significantly affecting other species appears to be slight. The cumulative effects of implementing the facilities program and all other proposed actions for any given alternative has the potential for being significantly greater than individual program actions considered separately.

Under any alternative, the design, location and permitted seasonal human use of facilities must be carefully evaluated relative to the needs of grizzlies and other T&E wildlife. Mitigation measures would include following the management direction in the greater Yellowstone area grizzly bear guidelines, and biological evaluations to insure that projects or combinations of projects do not jeopardize the continued existence of any T&E species. This process, carefully followed, should adequately protect T&E species.

On Range - Road rights-of-way remove a certain amount of land from domestic livestock forage production. This loss is negligible. Public use of these roads, particularly in management areas with intensive grazing systems, can disturb livestock and may result in gates being left open, and in general tend to increase the amount of livestock rustling. Conversely, increased and improved roads facilitate range management and provides for reduced costs of structural and nonstructural range improvement construction and maintenance.

On Timber - Roads are necessary under all alternatives except E to support the planned timber programs. The amount of roads vary by alternative in terms of location and amount of suitable timberland in each alternative.

On Water - Road and trail construction adjacent to and across streams would affect water quality by direct input of soil materials to the channel. Roads and trails that approach and leave a stream crossing on an incline represent continuing sources of sediment. (See effects on Water in the Timber and Minerals sections for discussions of sedimentation.) Large numbers of roads in a watershed can change the timing and quality of runoff significantly. Roads and trails placed in wet meadows or riparian areas can initiate systems of gulleys that are difficult to arrest. Road cuts can intercept subsurface water, causing continual maintenance problems and erosion. On much of the Forest, particularly in the forested areas, opportunities for road location are limited to alignments that closely parallel streams along narrow bottomlands and that approach crossings at unfavorable grades. Many such alignments lie wholly or partially within the floodway of a stream.

The risk of adverse cumulative effects from proliferation of roads and trails in a watershed varies by alternative according to the size of the transportation system anticipated for each. The amount of roads open to public use without restriction is an additional factor to consider. On this basis, considering the entire planning horizon, Alternative F provides the greatest risk of cumulative effects and Alternative E the least. In terms of open, uncontrolled roads, F is 40 percent higher than E. Alternatives B and C entail less risk than either A or D because of fewer road miles and more roads closed.

Minimization of local and cumulative impacts hinges upon a water monitoring program (Chapter IV, Plan) to determine for selected watersheds the level of acceptable change in relation to levels of disturbance. Standards and guidelines directing location and construction of roads are found in the Plan, Chapter III. Implementation of these measures is intended to minimize direct, local impacts and reduce the risk of cumulative effects.

On Wetlands and Floodplains - Floodplains and wetlands would be protected under all alternatives through Forest Direction management requirements and by riparian management established in the Forest Plan. (See Recreation Site Construction and Rehabilitation General Directions 4 and 5; Riparian Area Management and Rights-of-Way and Land Adjustments General Direction in Chapter III of the Forest Plan.) Wetland protection (as required by Executive Order 11990) would be provided by ensuring that new construction of facilities would not adversely affect wetlands or would be mitigated by improving other wetlands. In addition, wetland evaluation would be required prior to issuing special use permits in areas where conflicts with wetland ecosystems may occur. Specific standards and guidelines are designed to conserve riparian areas, protect floodplain values, and protect public health, safety and property from floods (as required by Executive Order 11988). Protective measures for riparian areas include: protecting upland areas immediately adjacent to riparian areas; stream channel stability maintenance; instream flow maintenance; and timber management that meets wildlife, visual and riparian ecosystem goals. Under all alternatives, floodplains would be managed by locating critical facilities out of floodplains or by using structural mitigation measures (e.g., deflection structures, riprap) to prevent adverse effects on public safety and property from floods.

On Soils - Soil productivity would be affected during construction of any facility. For collector roads, soil productivity will be permanently lost. Local road construction will result in either long-term impairment or complete loss of productivity depending on post-construction abandonment, restoration or use plans. Trail construction and maintenance similarly affects productivity, but the area affected is insignificant, Forestwide.

Because of the total number of roads available for use, and the low emphasis on road obliteration over the 50 year horizon, Alternative A would entail the greatest permanent or long-term impairment of soil productivity. Alternative E would result in the least impairment or loss, with slightly more than half the roads available in comparison to A. Alternative C has 300 fewer miles available for use (open or controlled) than A, with a heavier emphasis on year-round closures and road obliteration. Ranking of alternatives on the basis of highest anticipated soil productivity loss to lowest (from facility construction and maintenance) is as follows: A, F, D, B, C, E (See Table II-6).

The standards and guidelines addressing facilities, namely road construction, would insure that Forest lands dedicated to maintained or enhanced soil productivity would be protected through the facility development program.

Forest Direction for facilities development and maintenance is designed to control soil productivity loss at acceptable levels.

On Facilities - Existing maintenance of all facilities (Alternative A, Current Management) is slightly above the level considered minimum to maintain the usefulness and function of all facilities. Alternative emphasis determines to some extent the level of use certain facilities, such as trails and roads, will receive, while the use of other facilities, such as ranger stations, visitor information centers, communication sites, etc., are more or less constant. Hence, fluctuations up and down in gross reconstruction and maintenance dollars is to be expected while providing an acceptable level of maintenance. This is true for Alternatives A, B, C, D, and F. The effect of these alternatives on Forest facilities program are negligible. Alternative E, however, reduces the maintenance level so drastically that existing facilities, particularly roads and trails, will not be maintained at a level commensurate with demonstrated and historic use. Many trails will become unusable due to the severe natural erosion rate of the majority of the Forest area. Many existing roads are currently maintained twice yearly to permit wheeled traffic. Alternative E will result in many roads being closed for both safety and watershed concerns.

It is estimated that Alterative E would result in subsequent closure of about sixty percent of existing trails. Additional closure of about forty percent of existing roads above and beyond those designated as "closed" or "controlled" in the current direction alternative would be needed. Alternative E would lead to a gradual decline in the condition of structural facilities. Overall impact on facilities is judged to be moderate to severe.

On Fire - Workers and equipment associated with road and trail construction and reconstruction activities would increase the potential risk of human caused wildfires. Early detection and suppression, along with required fire precautions, would mitigate the risk. This effect would be similar for all alternatives except E which has much lower levels of planned activities. The effect would occur in proportion to the construction and reconstruction figures reported in Tables II-5 and II-6. When construction activities are completed, the risk of man-caused wildfires associated with construction will decrease. However, the risk from recreation use of the roads and trails may increase.

Access would be enhanced by constructing new roads and reconstructing existing travelways. This would increase the effectiveness of initial attack and suppression of wildfires and subsequently would reduce the role that wildfire plays in the ecosystem. This impact would be nearly the same for all alternatives except E, which has much lower levels of planned road construction and reconstruction.

On Insects and Disease - Road construction, reconstruction and obliteration would affect access on the Forest. Improved access would aid in the detection and control of insect and disease outbreaks. The magnitude of this effect would be similar for all alternatives except E, which has much reduced levels of planned construction and reconstruction. The effect would occur by alternative in proportion to the miles of road construction and reconstruction shown in Tables II-5 and II-6.

On Air - Air quality would be reduced temporarily by dust and emissions from equipment used during construction or reconstruction of facilities. Burning of slash during construction and emissions from vehicles using the road system and dust from untreated roads also would affect air quality. These effects would occur by alternative in proportion to the amount of construction and reconstruction. The effects on air quality would be temporary.

PROTECTION

The protection program includes activites such as detection and suppression of wildfires, fuel reduction to prevent wildfires, survey and suppression of insects and disease buildups, and law enforcement.

The objective of the integrated pest management program is to reduce damage and loss of Forest resources to insect or disease pests. In addition, the long-term goal of the program is to prevent any resource loss that is not consistent with management objectives. The objectives of the program are usually accomplished through vegetation treatment in conjunction with the timber, range, and wildlife programs. Activities include timber harvest, timber stand improvement, thinning, slash disposal and site preparation for reforestation. But timber management in any alternative will effect less than 0.5 percent of the Forest in any one decade.

Both plants and animals can become pests if population levels pose an actual or anticipated threat to the accomplishment of resource management objectives. The term "pest" may include insects, disease organisms, terrestrial and aquatic vegetation, vertebrates, and even certain environmental stress factors. It is Forest Service policy to minimize unacceptable resource damage caused by pests in a manner that is compatible with preservation of environmental quality. The overriding objective on the Forest is to minimize the effect of insect and disease infestations by reducing the susceptability of forest stands through Forest management practices.

When a pest problem does develop, further evaluation of the pest population will be conducted to determine its probable outcome and potential impact on achievement of management objectives for the area. Pest problems which threaten the attainment of management objectives can be minimized through direct or indirect means. Direct suppression of a pest is an action aimed at the pest population itself, whereas a more indirect approach may involve alternating one or more environmental conditions favorable to pest populations. Vegetation treatment is a key tool to be used in establishing and maintaining conditions that will reduce or minimize the risk of pest problems.

Pests affecting trees cause the most visible change in vegetation composition over time. Their impact is constrained by activities aimed at regulating timber yield. The level of vegetation treatment has importatnt implications to future pest activity levels during the planning period as well as in future years.

Diversity of tree age and species is also an important factor in the susceptibility of a forest to insect and disease damage. The greater the diversity, the more resistant a forest is to damage from any single pest. Proper silvicultural management of a forest provides for a distribution of stand ages and species on the portion of the Forest to be managed for timber.

Dwarf mistletoe is common in many of the lodgepole pine stands and is reinfecting the lodgepole pine regeneration in many of the areas harvested during the past twenty to thirty years. In addition to these pests, there are a number of other insects, rusts, cankers and rots prevalent in the overmature stands of all species. Decay is particularly prevalent in the Forest's aspen stands. These insects and diseases increase the potential for damaging fires, reduce visual quality, and reduce the growth of wood fiber.

Law enforcement on the Forest is accomplished through cooperative agreements with counties in the Forest area of influence and through Forest officer action. The Forest strives to avoid problems by making the public aware of regulations and by cooperating with local law enforcement agencies.

Program Outputs

Insects and diseases are a part of the natural forest environment and would continue to act as agents of change in the ecological process under all alternatives. Tree mortality would continue to occur across the Forest under all alternatives, especially in areas where access, topography or other resource uses preclude treatment. Surveys and monitoring are essential to identify any buildup of insects or disease that would require initiation of suppression measures.

The long range goal of insect and disease management is prevention and suppression through silvicultural treatment of susceptible stands. This strategy is based on the premise that susceptibility of trees to insects and disease is primarily a function of age and tree vigor (i.e., as stands age, they become more susceptible to catastrophic pest losses). Silvicultural treatments which remove overmature trees and reduce competition due to overstocking, as well as actual removal of infested trees, tend to increase the vigor of the residual trees and increase resistance to insects and disease on lands suitable for timber production.

Broadcast burning is not expected to be a major tool in fuel reduction or management of the Forest's timber resource. Other methods of fuel reduction such as lopping, scattering, piling or permitted firewood gathering are available to reduce fuels buildup. Fuels resulting from timber harvesting and timber stand improvement activities will be treated to meet Regional Acceptable Standards under all alternatives.

Vegetation treatment creates more diversity in vegetation and less continuous fuel beds. These are both favorable conditions for the control of wildfires. Vegetation treatment methods, particularly the use of prescribed fire, tend to reduce the wildfire hazard for a few years following treatment. The use of prescribed fire does increase the risk of causing wildfire, but this is mitigated to an acceptable level through proper planning and execution of the prescribed fires. The amount of area receiving vegetation treatment will be greatest under Management Alternative B. Therefore, the beneficial effects on fire protection will be greatest under this alternative.

Prescribed fire will continue to be an important tool in wildlife habitat management of treatment of willow and sagebrush, and occasionally aspen. However, since these vegetative types are relatively fire resistant during most of the year, these treatments will not significantly affect the Forest's fire protection program. Table IV-28 displays the acres planned for prescribed burning to improve wildlife habitat and domestic livestock range under the various management alternatives.

TABLE IV-28

Average Annual Acreage of Prescribed Burning to Improve Wildlife Habitat and Domestic Livestock Range (Willow and Sagebrush)

	Alternative					
	A	B	C	D	E	F
1st Decade	587	587	482	686	232	561
50 Years	593	596	501	650	258	565

Law enforcement activities would increase under all alternatives, except E, as more people visit the Forest for recreation or as other management activities increase. Emphasis would be given to the integration of law enforcement with natural resource management to prevent resource losses and protect Forest visitors.

Environmental Effects

On Recreation - The most significant adverse effect would be the absence of a protection program. Overall, the program contributes to the Forest goal of providing high quality recreation settings. The use of prescribed fire may cause local temporary reduction in recreation use.

On Visual Resources - The quality of the visual resource will be temporarily reduced where prescribed fire is used to accomplish any of a variety of management objectives. However the long-term effect of prescribed fire is to create and maintain vegetation diversity which enhances visual resource quality. Protection from insect and disease attacks of epidemic proportions maintains the visual quality of the forested landscapes.

On Cultural Resources - Both prescribed fires and wildfires can damage or destroy cultural resources. Especially susceptible are properties made of wood, such as historic cabins. In addition to fire itself, suppression or control practices, such as fireline construction, can be detrimental to these resources.

The potential adverse effects of both prescribed fire and wildfire can be significantly reduced by planning the control or suppression activities to avoid known sensitive cultural resource sites. In the long run, wildfire protection activities are in the interest of cultural resource preservation.

since the outbreak of major wildfires would have the most significant adverse effect on cultural resources.

On Wilderness - Natural ignition fires in wilderness, under prescribed conditions, become an opportunity to maintain natural ecosystem succession.

On Fish and Wildlife and Threatened or Endangered Species - Large, intense fires on the Forest would have a detrimental effect on fish and wildlife habitat. These adverse effects are primarily the loss of cover and sedimentation of streams. A more cost efficient fire protection program should prevent many of these adverse effects on fish and wildlife. Wildfire prevention would limit the potential loss of fish and wildlife habitat under all alternatives.

The use of prescribed fire is significant in the accomplishment of vegetation treatment necessary to reach wildlife objectives. The potential detrimental effects of prescribed fire upon fisheries will be mitigated through the careful planning and execution of prescribed fires.

On Range - The incidence of wildfire does not have a significant effect upon the range resource under any alternative.

Prescribed fire will be used to accomplish range management vegetation treatment objectives. There is a short-term local reduction in forage as a result of prescribed burning, but a long-term improvement in forage production.

On Timber - Fire, insects and disease all have an effect on the viability of the timber programs in all alternatives.

On Water and Wetlands - Prescribed burning and encouragement of natural frequencies of fire occurrence in the ecosystem would minimize watershed affects in the long run. Prevention of large wildfires would limit potential adverse effects on water quality. This effect would be the same for all alternatives. Burn area rehabilitation will be investigated for all significant fires.

Use of pesticides to control prairie dogs, insects, diseases and noxious weeds could contaminate water if improperly used. This effect would be mitigated by Forest Direction. (See Water Resource Improvement and Maintenance General Direction in Chapter III, Forest Plan.)

Large areas of insect and disease treatment using even-age systems could result in declining watershed conditions and loss of wooded riparian zones. Effects on water quality and wetland or floodplain utility are probable.

On Soils - The protection program would affect soil productivity. Large wildfires will result in the natural erosion rate greatly increasing for as much as 50 years following a timber burn. Fire is a natural phenomena, the result of which could be long term site productivity changes. Man-related disturbances such as fire line and base camp locations would be located, designed and closed in manner that would minimize erosion. Emergency burned area rehabilitation guidelines and monies are available for rehabilition of wildfire-burned environmentally sensitive lands. Suppression of some wildfires, fuel reduction and prescribed burns would protect long-term soil productivity. Refer to the range, wildlife and timber sections of this chapter for the effect of man-caused fire on the soil resource.

On Fire - Fuel and vegetation treatment would reduce wildfire under all alternatives. In general, the effect of the fire management program, including wildfire control and the use of prescribed fire for various vegetation treatment purposes upon other resource elements is to minimize losses from wildfire. The fire management program is also intended to accomplish management objectives through the use of prescribed fire.

On Insect and Disease - Infections of dwarf mistletoe would be reduced under all alternatives. The reduction would be less under Alternative E than other alternatives because of the limited vegetation treatment planned.

Local infestations of mountain pine beetle would be reduced under all alternatives by vegetation treatment (thinning or clearcutting) of infested stands. The potential for outbreaks would be greatest under Alternative E because of increased potential habitat compared to current conditions. Insect and disease problems in lodgepole and spruce/fir old growth would be similar in Alternatives A, C, D and F over the 50 year period. Alternative B would be considerably more effective in dealing with this situation than any other alternative.

On Law Enforcement - Under all alternatives, use of the Forest by people will increase. As the use increases, law enforcement problems will increase. Alternative E will have relatively lower use. Increased emphasis on law enforcement will be needed to protect Forest visitors and government property. Cooperative agreements with counties will continue under all alternatives.

On Air - Fuel treatment by burning would occur on a limited scale to temporarily contaminate the air with smoke under all alternatives. Mitigation includes cooperation with and notification to the State Department of Environmental Quality regarding prescribed burns, and adhering to adequately prepared burn prescriptions.

AIR RESOURCES

The air program includes the following general activities:

Administration of Air Resource Inventories
Cooperation in Development of Air Monitoring Programs
Coordination and Cooperation with other Agencies
Air Resource Monitoring

Significant effects on air resources can be tied directly to fuels treatments and other prescribed burning, wildfire, road construction and use, and oil and gas facilities. Such occurrences are or are likely to be found on the Forest. Significant effects on Forest air resources and values related to air quality can be caused by off-Forest sources of ambient air pollution.

The air program does not affect other resources except indirectly by protecting an amenity value supportive of quality recreation and a quality Forest environment. This protection adds costs to program management without providing quantifiable, marketable outputs. Such protection is legally mandated and reflected in Forest Service Manual Direction (FSM 2120) that is incorporated by reference in Chapter III of the Forest Plan.

WILD AND SCENIC RIVERS

Should the Clark's Fork of the Yellowstone River be designated as a component of the National Wild and Scenic Rivers System, its management would be in accordance with the Wild and Scenic Rivers Act (P.L. 90-542 as amended). Management requirements are stated generally in the Federal Register (FR Vol. 47, No 173. September 7, 1982) and specifically in the Clark's Fork Final Environmental Impact Statement. According to the FEIS, 21.5 miles of the river would be managed under requirements for a wild classification. Private land within the study area that includes a segment of the river would require some concessions from Wild and Scenic management requirements. Some constraints on the inholding could be imposed, particularly in regard to easements. Such constraints would be spelled out in the enabling legislation for designation.

Management of the River would preclude construction of the Clark's Fork division of the Beartooth Project reservoirs or any other reservoirs on the designated river segment. Water developments above or below the designated component river which would directly and adversely affect the free-flowing river values could also be precluded or modified. (Wild and Scenic Rivers Act, P.L. 90-542, Section 7[a].) A mineral withdrawal one-fourth mile wide on each side of the river would be continued (Wild and Scenic Rivers Act, P.L. 90-542, Section 9[a]iii). Opportunities for dispersed, primitive recreation would be enhanced with construction of two trails to the river and a river overlook (accessible by a short trail). An overlook along Wyoming highway 296 would be constructed to allow travelers to view the Clark's Fork Canyon. Vehicular travel over the existing primitive road in the Lower Canyon would be permitted to continue, although the road would not be improved. There would be no recreation developments in the Lower Canyon. The environmental effects and probable program outputs are more specifically defined in the Clark's Fork FEIS.

Prior to action by Congress, the River corridor would be managed according to direction for Management Area 10D (Plan Chapter III) under all alternatives.

RESEARCH NATURAL AREAS

The Research Natural Areas program includes activities such as signing boundaries, law enforcement, administration of research projects, and evaluation of RNA proposals.

There are presently no designated Research Natural Areas on the Forest. Five sites have been inventoried and are proposed for designation as RNA's in all alternatives. Table IV-29 describes the type, location and size of each area. A number of RNA's, including Meadow Lake, have been suggested by a task force of scientists and administrators at a recent Wyoming Natural Areas Conference. Location, acreages and suitability have not been precisely identified, but will be considered in the next decade or two as dictated by priority.

Program Outputs

The timing and establishment of the RNA's are dependent upon the needs and funding of research. The acreages of the sites are deleted from the timber, minerals, and range bases for all decades in all alternatives.

Environmental Effects

On Vegetation, Noise, Fire, and Insects and Disease - The effects of Research Natural Areas management would be the same as the effects of wilderness for all alternatives.

On Minerals and Energy Resources - Research Natural Areas would be withdrawn from mineral entry as they are established. Therefore, the effect would be a reduction of approximately 1782 acres available for mineral entry.

On Land Use - Land use would be restricted in areas designated as Research Natural Areas. Grazing by domestic livestock, vegetation management and motorized recreation would be restricted in these areas.

TABLE IV-29

Research Natural Areas for All Alternatives

Site Type	Name and Location	Estimated Acreage
Whitebark Pine	Picketts Knob (T43N, R109W, Section 1, 2, 12 and 13)	300
Douglas Fir	Pat O'Hara Creek (T54N, R103W, Section 5, 6, 7 and 8)	300
Limber Pine	Bald Ridge (T56N, R104W, Section 24 and 36)	200
Alpine Ecosystem	Twin Lakes (T58N, R104W, Section 17, 19, 20, 28, 29 and 30)	722
Permafrost	Peatbeds (T57N, R104W, Section 29)	160

PHYSICAL AND BIOLOGICAL EFFECTS

Table IV-30 compares physical and biological effects by alternative. The effects are the estimated cumulative or net result of carrying out the resource element programs described previously. The causes of these effects have been described in each resource element discussion. Detailed discussion of the

TABLE IV-30

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
VEGETATION								
Conifer Cover Type	Percent of Total Conifer Acreage 1/							
0-20 age class		21	9	14	8	8	2	8
20-40 age class		0	9	14	9	8	2	8
40-60 age class		0	15	16	14	15	10	15
60-80 age class		0	11	10	10	14	10	10
80-100 age class		3	0	0	0	1	0	0
100-120 age class		9	0	0	0	0	0	0
120-140 age class		0	2	0	1	1	1	2
140+ age class		45	32	24	36	32	53	35
All Age		22	22	22	22	22	22	22
Aspen Cover Type	Percent of Total Treatable Aspen Cover Type which is under Periodic Treatment	NA	70	76	74	70	40	68
Sagebrush Cover Type	Percent of Total Treatable Sagebrush Cover Type which is under Periodic Treatment	NA	33	34	30	37	16	32
Riparian Cover Type	Percent of Total Riparian Cover Type which is Managed	NA	All riparian cover type is managed with standards and guidelines in all alternatives.					

TABLE IV-30 (Continued)

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
RECREATION								
Primitive Nonwilderness	MACRES 1/	12	12	0	5	15	20	12
Semiprimitive Nonmotorized Nonwilderness	MACRES 1/	360	381	521	585	457	556	468
Semiprimitive Motorized	MACRES 1/	348	354	253	167	319	230	291
Roaded Natural	MACRES 1/	281	278	260	284	250	197	272
Rural	MACRES 1/	23	23	11	11	11	22	11
VISUAL								
Preservation VQO 2/	MACRES 1/	1413	1422	1610	1654	1589	1493	1670
Retention VQO	MACRES 1/	742	732	549	508	578	787	514
Partial Retention VQO	MACRES 1/	201	227	220	209	216	123	208
Modification VQO	MACRES 1/	63.2	47.5	48.5	56	44	27	35
Maximum Modification VQO	MACRES 1/	16.5	1.5	1.5	1.5	1.5	1.5	1.5
WILDERNESS								
Pristine Wilderness	MACRES 1/	138	146	139	135	159	139	151
Primitive Wilderness	MACRES 1/	714	735	769	710	740	565	658
Semiprimitive Wilderness	MACRES 1/	556	501	472	535	482	677	572
WILDLIFE								
Direct Habitat Improvement	ACRES/YR 3/	NA	376	467	492	467	277	434
WATER								
Water Yield Increase	AC-FT/YR 3/	2690	4150	4910	3770	4000	1850	3870
Sediment Yield Increase	MTONS/YR 3/	24.9	27.5	25.6	17.6	24.5	8.04	25.8
Water Quality, Wetlands, and Floodplains	Net change in risk of cumulative effects from current	NA	No Change	Decrease	Decrease	Decrease	Decrease	Decrease
	Relative risk of cumulative effects	NA	Very High	High	Very Low	Moderate	Low	High

TABLE IV-30 (Continued)

Comparison of Physical and Biological Effects

Item	Unit of Measure	Existing	Alternatives A Current	B Commodity Emphasis	C Noncommodity Emphasis	D Preferred	E Reduced Budget	F RPA
SOILS								
Erosion Increase	MTONS/YR 3/	399	385	338	177	322	76	330
FACILITIES								
Roads	Net change in wear from current trend	NA	No Change	Increase	Increase	Increase	Decrease	Decrease
Trails	Net change in wear from current trend	NA	No Change	Increase	Increase	Decrease	Decrease	No Change
AIR								
Air Quality	Net change in risk of air pollution from current trend	NA	No Change	No Change	Decrease	Decrease	No Change	No Change

1/ at the end of fifty years, MACRES = thousand acres

2/ VQO = visual quality objectives

3/ average annual over fifty years, MTONS = thousand tons

effects have also been described by resource element in the previous section, DIRECT, INDIRECT AND CUMULATIVE ENVIRONMENTAL EFFECTS. A summary discussion comparing the effects of each alternative is presented in Chapter II.

ECONOMIC EFFECTS

Economic analysis plays a major role in developing a Forest Plan. This includes both cost efficiency analysis and economic impact analysis. Cost efficiency analysis is the analysis prescribed in the NFMA regulations to deal with efficiency questions (see Appendix B under the heading EFFICIENCY ANALYSIS and 36 CFR 219.12(b)(f)(g)(h)). Economic impact analysis is the estimation of effects of different alternatives on local economies and population. It is discussed below under the heading ECONOMIC IMPACT ANALYSIS.

COST EFFICIENCY ANALYSIS

For cost efficiency analysis, inputs in the form of practices included in FORPLAN prescriptions are assigned a cost. Assignments of costs were based on past experience of staff in the Supervisor's Office and District personnel as to what it costs to do each practice under various field conditions and standards. Costs were assigned to practices based on the standards included in a specific FORPLAN prescription and the characteristics of the analysis area for which that FORPLAN prescription was developed.

Cost efficiency analysis was done for all prescriptions, benchmarks, and alternatives using FORPLAN models. Present net value (PNV) was the indicator used to measure cost efficiency. Present net value is defined as discounted benefits minus discounted costs. Over 70 catagories of benefits were included in FORPLAN and most were assigned an economic value. For market outputs of timber, range, and developed recreation, data from past experiences on the Forest were used to assign a benefit value. This was done by Regional Office staff and the Economic Research Service of the Department of Agriculture using data gathered from the Forest. For nonmarket goods and services such as dispersed recreation, hunting, fishing, and water, a willingness-to-pay value was calculated by the Washington Office (RPA) for use on the Forest. Calculation of willingness-to-pay values for oil and gas leases were done on the Forest using the procedures discussed in Appendix D. The values for oil and gas leasing were estimated using an experimental procedure. These values were not used in calculating PNV for the alternatives. However, results of this analysis and effects on PNV's for the alternatives are presented in Appendix D. All of the benefit values were represented in FORPLAN prescriptions based on how the practices and associated standards would effect production of each good or service on the analysis area for which a prescription was developed.

Cost efficiency analysis was done using a four percent discount rate. All costs and benefit values were in 1982 dollars. No real cost or benefit increases or decreases were used in analysis. All costs and benefits used in cost efficiency analysis were included in FORPLAN. The only cost not included was right-of-way acquisition costs. These were added by alternative based on the management strategies chosen for that alternative and the rights-of-way necessary for accomplishing those strategies.

Cost Efficiency Effects

Present net value (PNV) is the measure of cost efficiency used in forest planning. It is defined as the difference between the discounted dollar value of all priced outputs and the discounted value of all expenditures for management and investment. The process of discounting expresses all values at a common date. A large PNV indicates that the public, as owners of the National Forest, could realize a large net return from their investment. A smaller PNV indicates a smaller net return could be realized.

The intent of Forest Planning is to select an alternative which will maximize the benefit to the American public through management of the Forest. PNV is an important component or effect that is included in net public benefits. Because it includes the costs to taxpayers of producing all benefits, the real returns to the treasury associated with producing market-valued outputs, and the estimated worth of nonmarket-valued outputs, it provides a means of examining differences between alternatives.

Two kinds of prices were used in calculation of PNV. These relate to goods and services that have a market such as timber; and goods and services which are not normally traded in a market such as hiking, horseback riding, or viewing wildlife. For the first type of good or service, data on actual transactions on the Forest are used to calculate a price or benefit value used in analysis. For the second type of good or service, a "willingness-to-pay" value was calculated (see Appendix B for a more detailed discussion). In this way, an economic value is used in analysis to represent production levels of most goods and services.

Prices have not been assigned to all benefits, nor have methodologies for including all benefits in modeling been developed. It is primarily the desire or need of producing such nonpriced benefits that would cause selection of a alternative with a lower PNV than the maximum. Such nonpriced benefits include certain outputs, such as threatened and endangered species; certain physical conditions such as areas with high quality scenery; certain distributional effects, such as where the high quality scenery or wildlife winter range is located; certain reductions in risk, such as species and age distribution control for insect and disease management; and social and economic impact considerations.

Beyond these goods and services not valued in analysis, there is often an inability to distinguish various quality levels directly in economic efficiency analysis. This is particularly important when evaluating such things as the wildlife habitat or recreation opportunities provided by an alternative. In such instances, production levels between alternatives may vary little; however, because of standards and guidelines used in that production, quality of outputs can vary greatly.

The future value to society of Shoshone National Forest will depend upon the mix of economic and other values that are produced, the quality of those values, the costs of managing the Forest to produce those values, and the way society is affected. The trade-off between goods and services (recreation versus timber production, for example) is not a simple comparison between production levels of two or more outputs. This is because production of an individual good or service is not independent of production of other goods or services. For example, depending on the standards used to lay out timber sales, they can have either a beneficial or negative effect on wildlife. Large cut blocks are less expensive to prepare and to cut, but provide low quality edge for wildlife. Cut blocks of 25 to 35 acres with edges that provide security cover for wildlife can have a very beneficial efffect on the same species of wildlife while costing more from both a preparation and harvest standpoint. Following this logic, the trade-off is really between the forest conditions created by management and the mix of goods and services produced by those forest conditions, not between production levels of one output versus levels of another.

Formulation and analysis of alternatives on the Forest focused on alternative forest conditions by major ecosystem type (forested ecosystem, sagebrush grassland ecosystem, or aquatic ecosystems). The forest conditions modeled and used to build alternatives were designed to resolve sets of issues, concerns, and opportunites identified throughout the planning effort. (A more complete discussion of this process is included in Appendix B.) This means that a simple discussion of output level trade-offs or of economic indicators provides an incomplete picture of the real differences between alternatives. Even though this is true, such discussions are presented as part of the overall discussion of differences between alternatives.

As an example, examine the differences between Alternatives C and D, particularly in the area of timber harvest. A common belief is that timber harvest is detrimental to wildlife and therefore an alternative that harvests less timber is better from a wildlife standpoint. Effects on wildlife, though, are not as much of a function of how much is harvested but rather how and where such harvest is to take place. Further, as a side issue, wildlife is very much affected by the amount of roads left open for public use in such harvest areas. Comparisons between these alternatives from a timber versus wildlife standpoint therefore would require an examination of: the standards for harvesting, the types of forest conditions that would be achieved through such harvest, existing cover to forage ratios in areas where harvest is planned, and how roads used to support timber harvest will be managed in terms of public use. In the case of current conditions on the Forest, commercial timber cover often exists in large blocks between summer and winter ranges for such species as deer and elk. Further, the current age distribution is skewed toward mature to over mature timber providing poor cover-to-forage ratios and low quality edge. Given that standards for harvest require cut blocks no larger than 40 acres surrounded by cover, and that all roads built exclusively for timber harvest are to be closed to public access, greater benefits to wildlife can result from higher timber harvests. A simple one to one trade-off comparison between alternatives would tend to favor Alternative C, while more detailed examination shows that alternative D provides better edge and structural diversity for wildlife. Thus, simple trade-off comparisons, though important and of interest, provide only partial information when comparing alternative management strategies for complex ecosystems.

Each alternative was developed to address a set of issues and concerns efficiently. This was done through design and analysis of alternative forest conditions that could be achieved throughout the Forest. As such, each alternative provides a different mix or pattern of outputs and a different set of environmental, economic and social effects. This section discusses patterns of differences in economic effects.

Commodities which generate revenue to the treasury include timber, grazing of domestic livestock and developed recreation, including outfitters and guides (for analysis purposes the National Outdoor Leadership School in Lander was included as an outfitter and guide). Income and economic benefits from production of these goods and services comprise a small portion of the total economic benefit. In general, however, those alternatives which produce more of these commodities have higher PNV's. Primary reasons for this include the relatively small proportion of the Forest that can produce commercial crops of trees or be used by domestic livestock, coupled with a relatively low demand for recreation. With 57 percent of the Forest designated as wilderness and 85 percent of the Forest unroaded, capacity for all forms of recreation except developed recreation are far in excess of that which could be consumed. All alternatives provide for enough capacity to meet all demands for recreation. Thus the economic efficiency value of recreation production varies little if at all between alternatives. This, plus the fact that costs of production for timber and grazing of domestic livestock are exceeded by the benefits produced by these actitivities in all alternatives, account for the general trend of higher PNVs associated with higher production levels of commodities.

Differences between alternatives in terms of PNV, benefits produced, and costs incurred are illustrated in Tables IV-31, IV-32, and IV-33. Tables IV-31 and IV-32 display alternatives in order of decreasing PNV. Table IV-31 provides detail on incremental changes between alternatives in total discounted costs and total discounted benefits. Table IV-32 provides more detail in terms of the contribution to costs and benefits attributed to various classifications of goods and services. Table IV-33 provides detail on the distribution of costs in terms of fixed costs, investments, operations costs, and costs incurred by Forest users in production of goods and services.

The benchmark which maximizes PNV is also displayed in these tables to provide a basis for comparing each alternative with costs, benefits, and PNV which would result from managing the Forest from a maximum cost efficiency standpoint. Because only production levels and not quality of outputs are measured in economic efficiency, and because production levels of outputs are similar in all alternatives, ranking by PNV follows ranking by total discounted cost fairly closely. This is true except for alternatives C and E which de-emphasize production of commodities. Costs for these alternatives are lower than all other alternatives. The losses to total discounted benefits, because of much lower timber harvest levels and grazing of domestic livestock in these alternatives, exceed decreases in costs. As stated earlier, this is due in part to the fact that benefits from timber and range programs generally exceed their costs on the Forest.

The differences between alternatives, and even the ranking of alternatives, would be different and more extreme if economic costs and benefits of mineral development were included. Not shown in these or subsequent tables is the approximately $1.1 million generated annually from current oil and gas leases on the Forest. Income from these leases is collected by the Bureau of Land Management and was not used in the calculation of total discounted benefits. Further, this income to the U.S. treasury exceeds all other revenues generated on this Forest. Because the Plan does not affect current leases and because all alternatives provide the same number of acres available for leasing, the income generated through lease fees in all alternatives would be the same.

TABLE IV-31

Comparison of Present Net Value, Discounted Costs, and Discounted Benefits* (Billions of Dollars)

Benchmark or Alternative	PNV	Incremental Change in PNV	Discounted Cost	Incremental Change in Discounted Costs	Discounted Benefits	Incremental Change inal Discounted Benefits	Benefit Cost Ratio
Max PNV	419.1	--	102.9	--	522.	--	5.07
F RPA	418.92	-0.18	103.98	+1.08	522.9	+0.9	5.03
B Commodity Emphasis	416.6	-2.32	109.1	+5.12	525.7	+2.8	4.82
D Preferred	409.3	-7.3	107.6	-1.5	516.9	-8.8	4.80
A Current Direction	407.1	-2.2	110.9	+3.3	518.	+1.1	4.67
C Noncommodity Emphasis	406.8	-0.3	103.2	-7.7	510.	-8.0	4.94
E Reduced Budget	394.	-12.8	48.5	-54.7	442.5	-67.5	9.12

* All values are presented as incremental above minimum level management benchmark values.

TABLE IV-32

Comparison of Present Net Value, Discounted Benefits, and Discounted Costs by Resource Area (Billions of Dollars)[1]

Benchmark or Alternative	PNV	Recreation Benefits	Range Benefits	Timber Benefits	Water Benefits	Returns to Treasury	Recreation Costs		Roads & Facilities Costs		Timber Costs	Wildlife Costs	Range Costs
							Facilities & Trails Maintenance	Operation and Administration	Construction and Reconstruction	Operation and Maintenance			
Max PNV	419.1	469.8	22.78	12.61	3.94	18.77	23.81	6.03	8.61	13.07	6.08	1.92	1.03
F RPA	418.9	469.8	23.19	12.88	3.95	19.10	24.68	6.05	8.50	13.05	6.22	1.97	1.06
B Commodity Emphasis	416.6	469.8	22.60	15.19	5.00	21.31	25.16	5.55	10.35	13.03	9.18	2.05	1.04
D Preferred	409.3	468.9	21.96	13.25	4.06	19.27	25.15	5.48	10.13	13.90	6.44	1.97	1.13
A Current Direction	407.1	468.8	22.07	13.75	4.18	19.79	26.44	5.62	12.14	14.14	6.66	1.90	1.16
C Noncommodity Emphasis	406.8	469.8	16.34	10.54	3.51	15.70	25.58	5.64	8.55	12.92	4.97	2.05	0.84
E Reduced Budget	394.0	419.2	9.07	3.57	2.02	7.45	17.29	2.33	3.09	8.28	1.98	1.11	0.40

1/ All values are presented as incremental above minimum level benchmark values. Costs and benefits by resource area do not account for total costs and benefits. Some resource costs and benefits such as those associated with soil, water, and air are not shown, nor are fixed costs of running the Forest. Costs by resource area represent variable cost above fixed costs. Fixed costs varied insignificantly by alternative. Caution must be used in comparing resource area costs and benefits because costs attributed to one area provide benefits to other areas; for example costs incurred to increase range conditions produce more forage for both domestic livestock and wildlife. Benefits to wildlife are included in recreation benefits through increases in hunting and wildlife viewing caused by improving wildlife habitat. Returns to treasury are moneys collected through the sale of timber, grazing fees, and fees charged for developed recreation and special uses. Benefits include all such moneys as well as estimates of the value to the public of nonmarket goods and services such as dispersed recreation. Fees from mineral leasing are not included in either returns to treasury or benefits.

Table IV-33

Summary All Periods Discounted Benefits and Cost (Millions of First Quarter 1982 Dollars, 4% Discount Rate[1]

	Benchmarks #1 Minimum Level	Benchmarks #4 PNV M+A[2]	Alternatives A Current	Alternatives B Commodity Emphasis	Alternatives C NnCmmdty Emphasis	Alternatives D Preferred	Alternatives E Reduced Budget	Alternatives F RPA
Benefits								
Assigned Values	4089	490.4	489	491.3	484.5	488.9	426.5	490.7
Federal Receipts	0	18.8	19.8	21.3	15.7	19.3	7.4	19.1
Total Benefits	4089	509.2	508.8	512.6	500.2	508.2	433.9	509.8
Costs								
General Admin & Long-term fixed	8.65	31.6	31.7	32.1	31.4	31.7	8.82	31.7
Investment	0	14.8	18.8	17.2	15.3	17.3	7.58	15.1
Operational	0.25	41.9	49.2	44.9	45.3	47.8	22.7	42.15
Total Forest Service Cost	8.9	88.2	99.7	94.2	91.95	96.8	39.12	88.95
Non-Forest Service Cost	0	1.87	2.04	1.84	1.45	2.11	0.78	1.95
Total Cost	8.9	90.1	101.7	96	93.4	98.9	39.9	90.9
Present Net Value								
Present Net Value	4080	419.1	407.1	416.6	406.8	409.3	394	418.9
Benefit/Cost Ratio								
Benefit/Cost Ratio	459	5.65	5.0	5.34	5.36	5.14	10.87	5.6

1/ values for Benchmark #4 and alternatives are incremental from Benchmark #1
2/ market plus assigned values

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There are no geological structures for oil and gas production that have been proven on the Forest. Because of this, there was no attempt to estimate possible production levels of oil and gas and the revenues to the treasury and State of Wyoming that would be generated by such production. However, to include oil and gas considerations in analysis and to display relative differences between alternatives, a method for estimating the lease bid values by alternative was developed and used. This analysis procedure and results of the procedure are displayed in Appendix D. In short, this procedure attempted to estimate the value of leases based on the stipulations and operating standards that would be recommended under each alternative (see minerals discussion in Chapter IV and Appendix D for more detail).

The valuation analysis shows that all alternatives except C and D result in lease values at or near their maximum. Of the remaining two, alternative D is significantly higher than C. If added into the total PNV calculations, ranking of alternatives would change somewhat. In this case, Alternative A would follow the commodity alternative and its PNV would be greater than the preferred alternative. Next would follow the preferred alternative and then much further behind would be Alternatives E and C.

The reason for this result in terms of the value of leases is due to the stipulations and operating standards that would probably be recommended for oil and gas exploration and development. This is an illustration of a point discussed earlier. The quantified measure of areas available for leasing remains the same for all alternatives. This could be interpreted as if oil and gas leasing and production were either ignored in planning or were of such a significance that they overrode all other values. Neither was the case. It appeared that there was little legal justification for excluding oil and gas leasing on any portion of the acres available, assuming that a no-surface-occupancy stipulation would provide sufficient opportunity for the leasee. However, there are reasons for controlling such leasing and development so that each can be done in harmony with management of other resource values within each alternative. This is accomplished through application of alternative sets of stipulations and probable operating standards. Comparing quantitative measures for alternatives does not adequately display these differences.

Comparison of Alternatives in Terms of Net Cash Flow

A ranking of alternatives in terms of net cash flow, showing cash receipts and noncash benefits, is shown in Table IV-34. Net cash flow was calculated by subtracting cash receipts estimated for each alternative from the total budget cost of each alternative. The ranking of alternatives in this way is much different than ranking them by PNV. Further, the relationship between market and nonmarket production possibilities on this Forest is illustrated.

Cash receipts to the Forest, shown in Table IV-36, include stumpage prices paid for timber, grazing fees from domestic livestock use on the Forest, and fees charged for developed recreation (including fees paid by commercial operators, including lodges and outfitters and guides). Lease fees for oil and gas were not included because these fees are not collected by the Forest and as such are not part of the cash flow of the Forest. Of the fees charged, only those for timber represent the full dollar value to the American public of these outputs. Grazing fees, set by Congress, represent the difference between the full value

TABLE IV-34

Ranking of Alternatives By Net Cash Flow (Millions of Dollars)

Alternative	First Decade Net Cash Flow	First Decade Total Cost*	First Decade Cash Receipts**	First Decade Nonpriced Benefits***	Fifth Decade Net Cash Flow	Fifth Decade Total Cost*	Fifth Decade Cash Receipts**	Fifth Decade Nonpriced Benefits***
E Reduced Budget	-1.915	2.201	.286	14.01	-1.87	2.178	.308	17.98
F RPA	-3.839	4.598	.759	18.94	-3.466	4.251	.785	22.01
C Noncommodity Emphasis	-3.923	4.507	.584	18.69	-3.569	4.232	.663	21.73
B Commodity Emphasis	-3.923	4.77	.847	18.94	-3.609	4.475	.866	22.07
D Preferred	-3.946	4.708	.762	18.85	-3.587	4.386	.799	21.94
A Current Direction	-4.088	4.87	.782	18.88	-3.751	4.572	.821	21.92

* Costs are agency or taxpayer expenditures and do not include payments to Counties and expenditures by cooperators.

** Cash receipts are income from timber sales, grazing fees, developed recreation, and special uses such as lodges, ski areas, and outfitters and guides; they do not include cash income from mineral leasing estimated at $1.1 million per year.

*** These values do not include $164.2 million of nonpriced benefit from water which would be produced without any active management of the Forest.

TABLE IV-35

Comparison of Present Net Value, Net Cash Flow, Noncash Benefits, Employment, and Income

Alternative	Billion$ PNV	Million$ Net Cash Flow		Million$ Noncash Benefits*		Forest Dependent Employment (Number of Jobs)	Total Income to Economic Impact Area (Million Dollars)
		1st Decade	5th Decade	1st Decade	5th Decade		
F RPA	419.1	-3.839	-3.466	18.94	22.01	1227	16.22
B Commodity Emphasis	416.6	-3.923	-3.609	18.94	22.07	1269	16.91
D Preferred	409.3	-3.946	-3.587	18.85	21.94	1244	16.48
A Current Direction	407.1	-4.088	-3.751	18.88	21.92	1185	15.67
C Noncommodity Emphasis	406.8	-3.923	-3.569	18.69	21.73	1221	15.90
E Reduced Budget	394.	-1.915	-1.87	14.01	17.98	921	11.52

* These values do not include 162.2 million of nonpriced benefit from water which would be produced without any active management of the Forest.

TABLE IV-36

Average Annual Expenditures and Returns to the U.S. Treasury
(In Millions of 1982 Dollars)

	Alternative					
	A	B	C	D	E	F
Decade 1						
Budget Expenditures	4.87	4.77	4.51	4.71	2.20	4.60
Returns to Treasury	.782	.847	.584	.762	.286	.759
Decade 2						
Budget Expenditures	5.08	5.07	4.83	4.97	2.55	4.78
Returns to Treasury	.771	.840	.647	.758	.304	.750
Decade 3						
Budget Expenditures	4.78	4.57	4.49	4.61	2.32	4.38
Returns to Treasury	.825	.877	.662	.799	.305	.787
Decade 4						
Budget Expenditures	4.46	4.50	4.24	4.33	2.25	4.25
Returns to Treasury	.825	.890	.667	.807	.317	.792
Decade 5						
Budget Expenditures	4.57	4.48	4.23	4.39	2.18	4.25
Returns to Treasury	.821	.866	.663	.799	.308	.785

to the public of grazing and costs incurred by permittees. To account for that in analysis, the difference between fees charged and the total value to the American public were included in analysis as part of the nonmarket production benefits. Similarly, fees charged for developed recreation fall short of the total value to the American public of these outputs. These values were included as part of the nonmarket production benefits. Nonmarket production benefits also included benefits derived from dispersed nonwilderness recreation, wilderness recreation, hunting, fishing, and production of water above that which would be produced naturally. The ability of the Forest to produce market outputs is very limited. Only about 6 percent of the Forest is capable of growing commercial crops of trees and of that, only 3 to 4 percent can produce timber in an economically efficient manner. Similarly, only about 17 percent of the Forest is suitable for grazing of domestic livestock with about 5 percent of that occuring in winter range deemed crucial for supporting wildlife. These facts, plus a relatively low demand for developed recreation mean that total receipts collected for these outputs cannot and do not cover the entire cost of managing the approximately 2.5 million acres of the Forest.

Therefore, it is not possible for the Forest to show a positive cash flow when comparing direct receipts collected and total management costs. This could change if oil and gas is discovered on the Forest and receipts from such production are included in the cash flow calculation. The general trend in ranking of alternatives by cash flow is directly correlated with the budget; the smaller the budget the higher the net cash flow.

Two exceptions to this trend are found in Alternatives F and B. Both focus on producing high amounts of commodities at the least possible cost. Alternative F is the most efficient in this respect, and its increase in cost is more than compensated by the increase in cash receipts when compared with other alternatives. Alternative B has only a slightly higher budget than Alternative D, but again receipts produced by the higher overall commodity production of B more than compensate for this slight increase in cost during the first decade. Projections through the planning horizon show that by the fifth decade, the cash flow of Alternative B drops below that of Alternative D. This is because the intent of Alternative D is to move toward the desired management system of the Forest at a quicker rate and thus incurs slightly higher costs in the first decade.

The relationship between PNV, cash flows, and noncash benefits is shown in Table IV-35. From this table, it is clear that the noncash benefits derived through management of the Forest greatly exceed both the budgets and the cash flow deficits of all alternatives. This illustrates the point that the Forest and its management are valuable to the American public for such things as the total benefit from grazing, recreation and wildlife.

Production of timber and domestic livestock forage more than pay for themselves, as shown in Table IV-32. Costs and benefits directly attributable to these two areas of production show benefit/cost ratios of 2:1 to 3:1 for timber and up to 20:1 for grazing. In looking at all economic indicators, including impacts on local economies, it appears that a mix of outputs which produces cash flows and noncash outputs maximizes economic benefits to society. The question is then raised as to which mix is best. The difficulty of the question is compounded by taking environmental and social effects or imperatives into consideration.

Major Trade-offs Between Alternatives

Each alternative is designed to address issues and concerns differently. Complete understanding of differences between alternatives can be gained only by studying all of Chapters II and IV, as well as such appendices as A, B, D and F. A summary of comparisons between alternatives, touching on major differences in respect to issues and concerns, can be found in Table II-4. The purpose of this section is to discuss differences between alternatives in terms of economic indicators, including PNV, cash flows, costs and benefits of major program areas, and economic impacts. A summary of reasons for significant differences in these indicators is also given here, by alternative.

The primary reference for this discussion is Table IV-32. This table displays the ranking of alternatives in terms of PNV, benefits and variable costs directly attributable to each major program area. Costs for general administration, offices and equipment, and overall program management are not included. These costs are constant or nearly so for all alternatives and inclusion of them would mask real differences between alternatives. Even though costs directly attributable to each major program area are displayed, caution should be exercised when studying them. Many of these costs are for practices which produce multiple-use outputs. For example, one cost attributed to the timber program is timber sale preparation. In alternatives such as C and D, these costs include careful design of harvest blocks to maximize beneficial effects on wildlife and visual diversity. Therefore, such costs are not pure timber costs, but relate to wildlife and recreation as well.

There are no significant differences in alternative PNV's, the largest being a 6 percent difference between the reduced budget alternative and the RPA alternative. This is because all alternatives produce recreation use at or near the maximum anticipated demand (wildlife resources are valued through their recreational value for hunting, fishing and viewing). Recreation (and therefore wildlife) values produced on the Forest comprise about 92 percent of the benefit values of management. Because quantifiable recreation benefits do not change significantly by alternative, the fact that they comprise 92 percent of the benefit values means that PNV cannot change significantly between alternatives regardless of production levels for other goods and services. Significant differences between alternatives are in the quality of production, and how, where, or when practices are applied.

Alternative F. The PNV of this alternative is essentially the same as the maximum PNV benchmark (it is 0.4 percent less). This alternative responds to meeting the Forest's share of national production of goods and services, as directed under the authority of the Resource Planning Act of 1974. This includes meeting production targets for dispersed and developed recreation (including wilderness recreation), wildlife habitat, timber outputs, watershed improvement, and grazing of domestic livestock. The focus of this alternative is to meet these goals in the most cost efficient manner possible.

Differences between this alternative and the maximum PNV benchmark include a slight increase in both timber and grazing of domestic livestock. Doing this while meeting the same amount of recreation and wildlife outputs involves slight increases in costs for both of these areas. The increase in net cash flow generated by timber and grazing is not large enough to compensate for increased costs of the multiple-use management strategies selected to meet the total set of targets for all goods and services efficiently.

A major set of issues on the Forest relates to the negative effect of commodity production on both wildlife and recreation. The cost-efficiency orientation of this alternative emphasizes standard levels of timber harvest, road construction and maintenance, and oil and gas exploration and development. This means that though the quantifiable production levels of recreation and wildlife were met within this alternative, the manner in which they were met did not address this set of issues well. Given that much of this Forest is within the greater Yellowstone area, and as such is of national interest in terms of wildlife and recreation, not responding to this set of issues appears to be a significant flaw of this alternative.

Alternative B. The PNV of this alternative is 0.5 percent less than the maximum PNV benchmark. It was formulated to respond to issues and concerns calling for increased timber harvest, more grazing of domestic livestock, minimum restrictions on oil and gas exploration and development, and meeting maximum demands for developed recreation.

In this alternative, timber products and forage for domestic livestock are produced near their maximum levels. Coordinated management strategies necessary for such levels of production require more road construction and maintenance than in Alternative F. Also, larger Forest Service costs for managing timber, range, and recreation facilities would be realized. These increases in cost exceed the increase in revenues and benefits generated by higher production of the selected goods and services.

This alternative results in the maximum impact on local economies in terms of both jobs and income produced. So not only does this alternative address issues and concerns related to higher production levels of commodity oriented goods and services, it favorably addresses issues and concerns related to community stability and moderate growth as well.

Like Alternative F, the standards and guidelines for production of timber, grazing of domestic livestock, and oil and gas exploration and development are at the level necessary to meet minimum legal standards for impacts on soil, water, air and wildlife. Therefore, like Alternative F, this alternative does not adequately address issues and concerns dealing with the negative impacts of these activities on recreation, visual quality, and wildlife. Increases in production of these outputs, while meeting minimum water and air quality standards, increase the risk of cumulative impacts or site-specific violation of such standards. Further, because range management intensifies, costs of maintaining range structures imposed on permittees increases in this alternative. In some cases, the increase in permitted cattle AUMs would not provide sufficient revenues to cover increased range management costs.

Alternative D. The PNV of this alternative is 2.3 percent less than the maximum PNV benchmark. It was formulated to respond to issues and concerns related to production of high quality, low density recreation; high quality wildlife habitat; and low risk to air, soil and water resources. It was also formulated to meet historic demand levels of timber, forage for domestic livestock, and developed recreation (including outfitters and guides). It also allows for oil and gas exploration and development to the maximum extent possible while meeting objectives for recreation, wildlife habitat, watershed and visual resources.

When compared with the maximum PNV benchmark, this alternative produces nearly 4 percent more timber in the first decade. This production was made possible by slight increases in roads required for the multiple-use management strategies chosen. Production of forage for domestic livestock is about 1 percent less than for the maximum PNV benchmark, but shifts slightly toward more cattle rather than domestic sheep. The combination of shifts for timber and range mean that variable costs for these programs go up, while increases in timber benefits are almost identical to decreases in range benefits. Net change then is a slightly lower PNV for these two program areas.

In addition to this are increases in both road construction/reconstruction and road maintenance costs. These are incurred to provide better access to the Forest in response to issues calling for better access and lower density of recreation users. Similarly, there are increases in costs for recreation facilities, including trailheads and trails. Again, this is in response to issues calling for greater dispersion of recreation users and provision of higher quality recreation experiences.

Conversely, recreation operation and administration costs drop because this alternative provides more total pristine and primitive recreation than any other alternative. Again this is an attempt to meet issues calling for high quality, low density recreation. Because of this shift in recreation opportunities, administration costs go down in response to the lower costs of management for this type of recreation experience.

These are the most significant differences in the quantifiable measures of alternatives displayed in this Chapter. Other points of note in terms of meeting issues and concerns include standards and guidelines for timber management, road management strategies, and stipulations and operating standards that will be recommended under this alternative for oil and gas leasing, exploration, and development.

The forest condition selected as the target for even-age timber management in this alternative includes limiting harvest blocks to 25 to 35 acres in size. Further, adequate dispersion of harvest units and maintenance of wildlife cover surrounding cut blocks are called for. This forest condition was chosen to maximize the beneficial effect of timber harvest on wildlife, provide high quality edge, and provide for quality visual diversity. From a timber management standpoint, this also provides a mosaic of age classes that will be less susceptible to catastrophic insect and disease attacks.

As stated, this alternative requires more roads than the maximum PNV benchmark. These roads are necessary to provide access to the Forest for recreation, range management, wildlife management, and timber management. Roads open to the public, particularly in wildlife winter range, can be detrimental to wildlife. To mitigate this and meet the intent of this alternative, a high level of seasonal road closures is called for. This type of management is slightly more expensive than leaving those roads open and therefore decreases total PNV slightly.

As in all alternatives, all acres currently available for oil and gas leasing are available in this alternative. However, stipulations and operating standards for leasing, exploration and development are tailored to blend such operations into the management intent of this alternative. This is done on an area-specific basis, depending on the management strategy selected for each analysis area and the types of land (crucial preferred winter range, high hazard to soil and water, etc.) within each analysis area. (This is displayed in the minerals discussions in Chapters II and IV of this document and Appendices J and K of the Plan.)

By producing timber, developed recreation and forage for domestic livestock at or slightly above historic levels while emphasizing high quality recreation and wildlife habitat, this alternative provides for stability of local economies. This addresses issues and concerns related to maintaining such stability.

Alternative A. The PNV of this alternative is 2.8 percent less than that of the maximum PNV benchmark. This alternative was formulated to portray what would happen if the direction in existing plans and policies were implemented.

Timber production in this alternative is the second highest of all alternatives falling behind only Alternative B. In this case, the added timber benefits outweigh added timber costs which provide a marginal increase in total PNV. By providing timber at a level slightly higher than historic levels, this alternative addresses issues surrounding increased timber harvest and support for timber-based employment. This increase in timber production comes with a slight increase in acres suited for timber management. This occurs in areas of low productivity lodgepole pine and would slightly enhance the Forest's ability to deal with current insect and disease problems. Standards for timber harvest would not be as oriented toward maximizing wildife benefits from such operations as in Alternatives C or D. Further, the increase in road costs necessary for this increase in harvest are greater than the increase in net timber benefit. A high level of seasonal road closures is provided in this alternative to mitigate potential effects on wildlife water ranges.

Production of forage for domestic livestock is about the same as for the maximim PNV benchmark as are costs and benefits, which is sufficient to support historic levels of grazing on the Forests. This alternative favorably addresses range commodity issues. Further, this alternative includes fairly intensive range management; when coupled with wildlife improvements included in this alternative, the net effect would benefit wildlife. Additional costs are incurred to address issues and concerns surrounding quality wildlife habitat, with some local exceptions.

Recreation benefits are slightly less for this alternative than for the maximum PNV benchmark. However, costs for maintenance of facilities and trails are higher. Probable recreation use is less than the maximum that would be demanded under a different management emphasis, and the quality of facilities and experience will generally be high. These costs are incurred to address issues and concerns calling for provision of high quality recreation experiences.

Treatment of oil and gas issues in this alternative is identical to the treatments in Alternatives B, E and F. It therefore adequately addresses issues relating to commodity production as an overriding benefit. However, there are some areas on the Forest, particularly crucial winter ranges, where the standards for oil and gas operations are similar in this alternative to standards in Alternatives C and D.

Economic impacts of this alternative show little difference from others because of timber, range and recreation outputs produced. This alternative would provide for slight growth in local communities.

Alternative C. The PNV of this alternative is 3 percent less than that of the maximum PNV benchmark. This alternative was formulated to address issues and concerns calling for more emphasis on amenity values and less emphasis on timber harvest, grazing of domestic livestock, and oil and gas leasing, exploration, and development. It was also formulated to meet demands for more quality recreation, including better access to the Forest. Amenity values include wildlife and fish, watershed, and visual and recreation experiences in a natural or near-natural setting.

In attempting to meet these issues and concerns, timber harvest drops below historic levels and planned harvest is 25 percent below that of the maximum PNV alternative. This decreases both timber costs and benefits with a net decrease in PNV of about a billion dollars over the life of the plan directly attributable to changes in timber. Similarly there is a 28 percent decrease in forage for domestic livestock, accounting for a decrease in PNV of about 5 billion dollars. Because all alternatives would produce about the same recreation benefits, increasing emphasis on recreation did not offset these losses to PNV. In terms of overall PNV (419 billion in the maximum PNV benchmark) these decreases are not significant.

Under this alternative, forage available for wildlife increases significantly over other alternatives except E. However, most of this increase occurs in summer range where there is already ample summer range available to support herd unit targets for the Forest. All alternatives provide protection of crucial preferred wildlife winter range and most meet herd unit targets over the Forest with one exception. That one exception (the North Fork elk herd unit) can not be provided for in any alternative. Therefore, there are no increases in wildlife benefits to offset the losses in PNV caused by decreasing forage for domestic livestock.

This alternative contains the same standards for timber harvest as Alternative D. Thus, timber harvest under this alternative would be designed to maximize beneficial effects on wildife. The decrease in harvest in this alternative, however, would make the overall benefit less than that of Alternative D.

Also, like Alternative D, this alternative contains stipulations and operating standards for oil and gas leasing, exploraticnm, and development that are more stringent than those in other alternatives. This would lessen risk to air, soil and water as well as mitigate effects on recreation, visuals and wildlife. Imposition of these standards has a significant effect on lease values and PNV associated with oil and gas, dropping both significantly.

Because this alternative produces timber and forage for domestic livestock at lower than historic levels, and because all alternatives provide enough recreation opportunities to meet demand, this alternative would have a tendancy to destabilize local economies. There would be no increase in recreation-related jobs to compensate for jobs and income lost in areas related to timber and ranching. Over the entire economic impact area, the significance of this is minor. However, in some of the small communities adjacent to the Forest, this could have a significant effect by causing a downturn over at least the next five to ten years.

Alternative E. The PNV of this alternative is 6 percent less than that of the maximum PNV benchmark. This alternative was formulated to respond to issues and concerns associated with the possibility of budget reductions. It portrays one possibility that could occur if the budget was reduced to 75 percent of the 1982 fiscal year budget.

Decreases in PNV are related to an across the board decrease in production of all goods and services. Timber production drops by almost 72 percent from the maximum PNV benchmark. Forage for domestic livestock is reduced by almost 60 percent while recreation benefits fall by almost 11 percent. The decreases in costs necessary to produce these outputs are far exceeded by the loss of benefits at the lowered production levels.

Even though recreational benefits are 90 percent of their maximum, the associated decreases in costs for maintenance of facilities and trails, coupled with decreased costs of operation and administration mean that the quality of recreation will decrease from current levels. This quality will be significantly below the quality provided in other alternatives. Thus this alternative does not address issues and concerns calling for high quality recreation experiences. Further, the decreases in road construction and maintenance means that access problems will not be resolved and the attractiveness for motorized recreation, including driving to a trail head, will decline.

Similarly, decreases in range management and timber management will adversely effect the ability of the Forest to provide quality wildlife habitat. The majority of increases in forage will be on summer range where there is already enough to support herd unit targets. Decreases in timber harvest will mean that the small amount that could be done to improve spring-fall range through appropriate timber harvest will be curtailed. Thus, this alternative does not favorably address issues and concerns dealing with provision of greater amounts of quality wildife habitat and may mean a slow decline in current wildlife population levels.

Issues and concerns regarding historic demands for timber and forage for domestic livestock will not be favorably addressed in this alternative. Most mills and many dependent ranchers will effectively be put out of business.

This alternative allows for oil and gas leasing, exploration, and development with standards to meet minimum legal requirements. From this standpoint, it favorably addresses issues and concerns that call for the fewest possible restrictions on such operations. But as with alternatives A, B, and F, it does little to address concerns about tailoring such activities in recognition of the visual, recreation, and wildlife resource values of the Forest.

Economic impacts of this alternative are the most significant of all alternatives because of decreases in timber, range, and recreation outputs.

There would be decreases in jobs and income in industries related to these outputs.

ECONOMIC IMPACT ANALYSIS

In order to estimate impacts on local economies and population, IMPLAN and economic input/output model was used. This was done for the two economic impact areas of the Forest, represented by Park County and Fremont County, Wyoming. Data used included the standard IMPLAN database of secondary information coupled with primary data to include outfitters and guides as a separate sector (see Appendix B for a full explanation of these models).

Economic Impact Effects

Table IV-37 displays the economic impacts of alternatives in terms of changes in population in each economic impact area, the number of Forest-related jobs, unemployment, and personal, property and total income. Table IV-38 shows payments to counties.

The ranking of alternatives in terms of beneficial economic impacts is the same for both economic impact areas; Alternative B is best and then D, F, C, A and E. All economic impact indicators follow this progression with one exception. The exception is Alternative C in the northern economic impact area. In this case, there is a relatively larger change in population and significantly lower impact on unemployment than in other alternatives. As discussed in the alternative PNV comparison, recreation sectors of the economy are about at maximum in terms of meeting demand. Therefore, workers with skills in recreation-related sectors are nearly fully employed. Alternative C emphasizes decreases in commodities in order to focus on preservation of the Forest in an effort to enhance recreation and wildlife. Workers necessary for supporting increases in recreation must migrate in, leaving unemployed those currently unemployed in sectors associated with timber production and ranching.

Economic impacts associated with changes in timber harvest are probably understated in Table IV-37. The reason for this lies with the assumptions built into IMPLAN. IMPLAN is an analysis tool built to support Forest Planning nationally. It assumes a national standard for technology in each economic sector. While these assumed technologies are fairly accurate for representing recreation and ranching sectors in the two economic impact areas, they do not adequately represent the timber-sawmill sectors of these impact areas. Nationally, there has been a movement to high automation within the timber industry. This brings with it high capital cost, a need for high volumes of timber, and relatively few jobs per million board feet processed. Only one of the many mills that buy timber from the Forest fits this national norm (the L.P. mill in Dubois), accounting for 30 to 40 percent of the Forests timber cut. Other mills that buy timber from the Forest are small, labor-intensive mills that deal with a multitude of products including specialty products. They, on average, have significantly higher manpower requirements per million board feet of timber.

If factored into analysis, this difference in manpower requirements would tend to increase the impacts of those alternatives which produce higher levels of timber while decreasing the relative impacts of alternatives which decrease timber harvest. This could mean a reordering of alternatives in terms of

TABLE IV-37

Forest-Related Population, Income, and Employment Impacts[1]

	Population	Personal Income (Million Dollars)	Property Income (Million Dollars)	Total Income (Million Dollars)	Employment (Number of Jobs)	Unemployment (Percent)	Payments to Counties (Million Dollars)
Fremont Economic Impact Area							
Total	33,637	109.0	69.	178.0	9516	4.00	
Forest-Related (1977 Base)	429	2.28	1.44	3.73	284	---	
Changes from Forest-Related Base by Alternative (1990 Index Year)							
B	+750	+2.14	+1.36	+3.49	+277	-0.68	.1165
D	+710	+2.02	+1.27	+3.28	+265	-0.67	.1048
F	+692	+1.96	+1.24	+3.2	+259	-0.66	.1045
C	+677	+1.87	+1.13	+2.99	+253	-0.65	.0803
A	+624	+1.8	+1.15	+2.94	+238	-0.64	.1075
E	+294	+0.72	+0.34	+1.05	+117	-0.34	.0393
Park Economic Impact Area							
Total	12,600	70.28	108.1	178.3	6701	3.84	
Forest-Related(1977 Base)	246	2.48	1.57	4.06	290	---	
Changes from Forest-Related Base by Alternative (1990 Index Year)							
B	+710	+3.37	+2.27	+5.64	+419	-0.60	.0953
D	+686	+3.24	+2.17	+5.42	+406	-0.60	.0857
F	+666	+3.13	+2.11	+5.24	+395	-0.60	.0855
C	+670	+3.12	+2.01	+5.13	+395	-0.54	.0657
A	+626	+2.94	+2.01	+4.95	+374	-0.60	.0880
E	+392	+1.69	+1.00	+2.69	+231	-0.32	.0322

1/ Data on the economic structure of the two economic impact areas came from the data base developed nationally to support the IMPLAN computer program (see Appendix B). Employment data was derived from County data gathered by the State of Wyoming and the U.S. Census Bureau.

TABLE IV-38

Payments to Counties (In Millions of 1982 Dollars) 1/

	Alternative					
	A	B	C	D	E	F
Decade 1						
Total Payments	.196	.215	.182	.195	.076	.182
Decade 2						
Total Payments	.183	.202	.168	.181	.075	.182
Decade 3						
Total Payments	.211	.226	.193	.211	.079	.208
Decade 4						
Total Payments	.203	.222	.193	.213	.080	.210
Decade 5						
Total Payments	.214	.222	.193	.213	.080	.210

1/ Payments to individual counties were not calculated economic impacts. Such a reordering would shift the relative ranking of Alternatives A and C, with A having a greater impact than C. Ordering of other alternatives would remain the same, resulting in a relative ranking of B, D, F, A, C, and E.

SOCIAL EFFECTS

Each alternative, and the perception of the emphasis of each, can impact the social well being of local communities. These effects are often described in terms of lifestyles, attitudes, beliefs, values, social organization, population, and land use. A procedure for social impact assessment that focuses on identifying polarization levels provided information for assessing how each alternative would effect social well-being (see Appendix F). Also, many effects on measures of social impacts are based on economic impacts. For this reason, economic impact information was also used to assess social impacts. (This was one of the reasons for defining economic impact areas and social impact areas with the same boundaries.)

Polarization is a measure of how issues concerning resource management will be accepted by the public. The more polarized a community becomes, the more likely there will be groups organizing and taking sides on resource management issues. This could lead to appeals and court battles as each side fights for its belief. Not only does this affect management of the Forest, but it affects the social well-being of communities as well.

In any community, there is a pool of volunteer time, donations, and other resources that people are willing to give to keep abreast of changes in their community. If a community becomes polarized, then some of those resources are devoted to resolution of the polarizing issues. Further, as groups organize, group members tend to change their lifestyles, attitudes, beliefs, and values toward extremes. Often this detracts from cooperation, encourages confrontation and tends to change the ability of social organizations to find resources and volunteers to work together in community betterment projects.

Social impact analysis was done for two impact areas: a northern area representing impacts on Park and Hot Springs counties; and a southern area representing impacts on Fremont, Teton and Sublette counties. These represent social impacts of managing the northern three districts and southern two districts respectively.

Results of social impact assessment for preliminary alternatives showed that people in both social impact areas were polarized over some facets of current management. Polarization increased as the emphasis of an alternative moved toward production of commodities at the expense of noncommodity values, and decreased as the emphasis of an alternative shifted toward protection and enhancement of noncommodity values such as wildlife, scenic beauty, and high quality recreation. In one measure of polarization, it was found that a mix of commodity and noncommodity emphases tended to lower the intensity of polarization. In other words, people still tended to choose sides, but their interest in organizing to fight for one side or the other was lower than with a single emphasis on either noncommodities or commodities. The following assessments of impacts on lifestyles, attitudes, beliefs, values, social organization, land use and population are based in part on this assessment of preliminary alternatives.

NORTHERN SOCIAL IMPACT AREA

Social impacts of managing the northern three Ranger Districts, Clarks Fork, Wapiti and Greybull, are typified by impacts in the northern impact area.

Lifestyle. Lifestyle in the northern impact area is affected by the Forest in a number of ways. First, the Forest is used by many for meeting their recreational needs including needs for solitude. The abundant game, scenic beauty, and relatively low density of use on the Forest contribute greatly to the lifestyles of most residents. Beyond this, some base their lifestyles on working directly with production of goods and services from the Forest; these include ranchers, wranglers, outfitters and guides, lodge owners, and lumbermen. By changing the mix of goods and services produced and the way those goods and services are produced, management of the Forest can greatly affect these lifestyles.

Because Alternatives A and F are so close to one another in terms of production of goods and services, their effects would be the same, and would not significantly impact current lifestyles. However, current policies regarding oil and gas operations are causing some changes in lifestyles. These policies are found in both of these alternatives. Under these alternatives, post cooperation among many individuals would change to competition. If continued, this could degrade relationships which form a basis for at least part of the lifestyles enjoyed by local residents.

The trend away from cooperation, and its impacts on lifestyles, would be heightened in Alternative B. Alternative B would be perceived as a threat to many lifestyles by local residents because of the commodity emphasis of this alternative. Many more people are dependent on the noncommodity goods and services from the Forest to help define their lifestyles than on commodity goods and services. This alternative is perceived as a threat to noncommodities by opening the Forest with minimum restrictions to oil and gas development and increasing the amount of area roaded and managed for timber. Alternative B would have a net negative effect on lifestyles.

Alternative C, with its emphasis on production of noncommodity goods and services would have generally slight effects on local lifestyles. However, some who define their lifestlyes in terms of ranching, timbering and oil and gas operations would be adversely impacted because of the decreases in these areas. Stringent stipulations and probable operating standards for oil and gas operations, applied Forest-wide, would be perceived as a threat to the livelihood and lifestyle of one segment of the area's population.

The effects of Alternative E would be similar in the short-term except for impacts related to oil and gas operations. In this respect, impacts would resemble those of Alternatives A, B, and F. Over the long-term, Alternative E would have a net detrimental effect while trails, wildlife improvements, and Forest conditions deteriorate because almost all lifestyles in this area include outdoor pursuits. In terms of impacts on local lifestyles, this alternative has the potential for the most significant impacts.

Alternative D would have a net benefical effect on local lifestyles. As stated earlier, this alternative favors production of noncommodities which should beneficially impact those lifestyles associated with recreation and hunting. It favors this production jointly with production of commodities in a cost efficient way whenever possible. This results in a slight increase in production of commodities above current levels which would be beneficial to those lifestlyes associated with commodities. As stated earlier, there is a growing polarization over current policies regarding timbering, road building and oil and gas development. This alternative attempts to blend these uses of the Forest into a coordinated management strategy for noncommodity resource values. As such, it should allow most lifestyles to continue as in the past while removing some of the current polarization over these issues.

Attitudes, Beliefs, and Values. Attitudes, beliefs, and values would be detrimentally impacted under Alternatives A, B, E, and F. This is because these alternatives would create increased polarization between commodity users of the Forest, particularly oil and gas interests, and noncommodity users. This polarization has already had a detrimental effect on attitudes, beliefs and values, as people have organized into groups to fight with each other in public forums. Competition, rather than cooperation, would prevail under these alterantives.

Alternative C would have a slightly negative effect, but not as great as A, B, E or F. This is because the majority of groups are either for or are neutral to an emphasis on noncommodity production. There would be some polarization under this alternative because of the decrease in forage for domestic livestock, decrease in timbering and restrictions on oil and gas operations. Through time, this alternative would affect the types of people living in local communities. More people related to recreation and wildlife sectors of the economy would move into the area. Further, some that are currently employed or skilled in timbering, oil and gas operations or ranching could leave the area. This shift would affect the mix of attitudes, beliefs and values prevalent in the area now.

Alternative D would either have no effect or slightly positive effect on attitudes, beliefs and values, for it requires close coordination between potentially competing interests. It provides for an emphasis on high quality recreation and wildlife habitat management. In this way it would help maintain values that are historically associated with the Forest. It would do this in a way that also provides for historic levels of operations in developed recreation, timbering and ranching. It would help the area retain these sectors of the population and the mix of attitudes, beliefs and values associated with them. Acceptance of this alternative would require compromise on the part of currently polarized interests dealing with oil and gas operations.

Social Organization. Alternatives A, B, E, and F would have a negative effect on social organization. This has been illustrated recently by the way some community betterment organizations have lost participants and donations as people have organized in conflicts involving oil and gas operations on the Forest. Further these alternatives would contribute to increased polarization. Because of the relatively small population base of this area, many organizations, both formal and informal, would find a split within their memberships between those who favor development and those who favor preservation.

Alternative C would have a different effect on social organizations. Many in the local area favor a noncommodity emphasis on the Forest. But, as commodity production declines based on this alternative, those associated with commodity production would become more vocal. This would tend to impact social organizations in ways similar to Alternatives A, B, E and F. Beyond that, there would be more people, possibly greater unemployment and potentially lower tax revenues generated by such things as timber and oil and gas. This would put an additional burden on local organizations to provide services while the pool of dollars and volunteer services are declining. Some organizations could find such a situation a threat to their viability.

Alternative D is designed, in part, to avoid problems associated with other alternatives. It is designed to reduce intensity of polarization, but not to eliminate it (total elimination of polarization is not possible). Reducing the intensity of polarization and emphasizing coordinated development of resources, where amenity and commodity values must be considered together, would provide a forum for negotiations. It would foster close working relationships between all factions involved or affected by management of the Forest. Results of this type of working relationship could spill cver into other areas of community life, making it possible for social organizations to tap the full depth of experience available locally. Further, careful production of commodities and operations associated with oil and gas operations are provided for within this alternative. This will help stem the currently declining tax base, particularly if a major oil and gas find is discovered and developed. This in turn will provide resources for both formal and informal social organizations to provide necessary services to local citizens.

Population and Land Use. Alternative E would have the most significant effect on population and land use in relation to its large negative impact on the number of jobs supported by the Forest. Recently there has been a flurry of oil and gas exploration activity, but this has been of a short-term nature and has not stemmed the decline in jobs or economic activity associated with this economic sector. The decline in Forest-related employment in this alternative would contribute to this decline in population and economic viability.

Alternative C could have a significant effect on short-term population growth for it has the largest relative increase in population. This, combined with potentially greater unemployment, would impact population and land use significantly.

Alternatives A, B, D and F would be similar to each other, regarding impacts on population and land use. Each would result in about the same change in employment, while bringing in more people. Such immigration would involve a mix of economic sectors, including recreation, timber, ranching and oil and gas operations. This mix would be similar to the current mix, so that growth would follow current patterns. None of these alternatives would cause changes in population beyond the ability of local communities to provide for resulting growth.

SOUTHERN SOCIAL IMPACT AREA

Social impacts of managing the southern two Ranger Districts, Wind River and Lander, are typified by impacts on the southern social impact area.

Lifestyles. Lifestyles in the southern social impact area associated with the Forest are dependent on both commodity production and noncommodity production. Timber and ranching lifestyles make up a significant portion as do outfitting and guiding and recreation oriented lifestyles. This means that alternatives favoring one over the other would have a net negative impact on lifestyles. This includes Alternatives B, C, E, and F. Alternative A and D would have the same type of effect as in the northern social impact area.

Attitudes, Beliefs and Values. Alternatives would have similar impacts on attitudes, beliefs and values in the southern social impact area as they do in the northern area. Conflicts in attitudes, beliefs and values in this social impact area appear to focus on wildlife and recreation use of the Forest versus timber harvest and grazing of domestic livestock. On one side, there is a belief that timber operations and grazing will detrimentally effect wildlife in particular and nonmotorized recreation as well. This belief is strong and many have joined organizations that support this position. On the other side, there are many who view timbering and ranching as vital components of the local economy and culture. They point to areas on the Forest where such operations appear to be beneficial to wildlife as well as to visual diversity. Organizations supporting this belief have also been established recently, in part to counter the efforts of organizations on the other side of this issue. This is not just a local debate. It has involved people from across Wyoming, leading to testimony before Congress by local citizens and representatives of the State of Wyoming.

In this context, alternatives which favor one side or the other would tend both to polarize those in local communities and to galvanize their beliefs. This would be the impact of Alternatives B, C, and F. Alternative A would have a similar impact for there is significant debate concerning current management policies and plans.

Alternative E would in the short term, have an impact similar to Alternative C. It appears that many who have the belief that timbering and grazing of domestic livestock are harmful feel that the less management done by the Forest Service, the better wildlife and recreation resource values will be preserved. In the long term, as wildlife habitat improvements, trails and recreation facilities decline under this alternative, there would be growing dissatisfaction and public sentiment for more active management of wildlife and recreation resources. This could trigger a long-term change in attitudes, beliefs and values of this group. Those with beliefs that commodity production is a higher priority function of the Forest will be dissatisfied with this alternative from the beginning. This will tend to galvanize their beliefs and will probably cause them to contribute more time and money to fight for their position. No change in their attitudes, beliefs and values other than a reinforcement that they are correct will occur under this alternative.

Alternative D has the potential for altering attitudes, beliefs and values rather than galvanizing them. It is designed to emphasize noncommodity goods and services while producing historic levels of commodities. Many people in this social impact area do not believe that this is possible. As implementation occurs under this alternative, and as public participation is encouraged, changes in beliefs are possible. This in turn would defuse current polarization within this social impact area.

Social Organization. Controversy and polarization of local residents has grown since the social analysis supporting the draft EIS was done. It appears now that substantial time and resources have been diverted recently from many local social organizations. These resources have been mobilized to help bring the viewpoints of the two sides discussed above to local, regional and national forums. This tends to have a negative effect on older social organizations in the area. This effect on social organizations and clubs would place additional burdens on local formal organizations whose role it is to provide social services. Though the controversy and creation of new advocate groups do not appear to affect residents of the Wind River Reservation directly, placing additional burdens on county-wide support organizations may hamper the provision of some services to these residents.

Alternatives A, B, C, and F would continue the trend of taking resources away from existing social organizations. In the short term, Alternative E would have a similar effect, but over the long-term it may bring groups together to push for more active management of the Forest. If Alternative D works as designed, it will continue this trend but to a much lower degree over the short-term. In the long-term (between 5 and 10 years), it could reverse this trend.

Population and Land Use. Effects on population and land use would be similar to those in the northern social impact area. In communities such as Dubois, many residents associated with recreation sectors appear to be more affluent and tend to reside outside the city limits. This trend, over about the last ten years, has brought about a proliferation of development in rural areas. Some of this has occurred on important winter range for deer, elk and moose. All alternatives except E would continue this trend. Alternative C could have the most significant impacts in bringing about such development.

Many communities in this area are experiencing an economic downturn associated with declining activity in mining, energy-related industries and timbering. Alternatives which produce at least historic levels of commodities or which facilitate oil and gas activities would tend to slow this decline. The descending order of alternative commodity production levels would be Alternatives B, F, A and D. Alternatives C and E could have just the opposite effect and could contribute to the economic decline. Such a decline would appear to affect people who live in towns more than those in rural areas. If continued, this trend will change the proportion of people living within city limits of local communities to those who live outside those limits, shifting toward a more rural population. This could impact the ability of an affected community to provide necessary support services and to control point and nonpoint sources of air and water pollution.

MINORITIES AND WOMEN

Minorities and women could be affected by implementation of any of the alternatives in one of two ways: (1) members of minority groups and women could be hired directly by the Forest Service, and (2) members of minority groups and women could obtain Forest Service contracts and permits or could work for those who do. At the end of fiscal year 1984, there was one minority employee on the Forest. There were 20 women employed; two were professionals.

Although the ratio of minority and women employees to total employees should not differ by alternative, alternatives with lower funding levels will disproportionately affect these individuals because of two factors. First, a high percentage of minority groups and women occupy the lower level positions, and these positions would be most likely to be abolished in a reduced funding situation. Second, many of these individuals have less seniority that other employees (emphasis on Equal Employment Opportunity in the federal sector occurred in the early 1970's), and if the work force is reduced, these employees would be more likely to be separated. The funding level of an alternative, then, is the most relevant factor to use in predicting changes in direct employment of women and minorities. The alternatives ranked in order of decreasing budgets in the first planning period are as follows: A, B, D, F, C and E.

Contracts that are let by the Forest would also affect minorities and women. In 1982, approximately ten percent of the dollar value of all contracts was set aside for "8A" contracts which are reserved by the Small Business Administration to develop minority contract opportunities. Alternatives A, B, D and F, with high emphasis on market outputs, would provide the greatest opportunity for women and minority contracts, while Alternatives C and E, with low emphasis on market outputs, would provide the least.

Certain types of development within the boundaries of the Forest could also affect minorities by altering such factors as income and employment patterns, cost of living and community stability. Problems would be especially acute in communities that have relatively high proportions of minority residents. Examples of developments that could have these effects include minerals extraction, timber sales and recreation sites. These developments would lead to the creation of a limited number of semiskilled and unskilled positions, but a portion of these positions would be short lived and therefore not able to support resident minority populations.

There could be some other effects, particularly on residents of the Wind River Indian Reservation. If current trends of polarization continue, more and more resources outside the Reservation will be diverted to fight for opposing sides of resource management questions. Alternatives A, B, C, E and F would contribute in varying degrees to this trend. Loss of resources within volunteer organizations will mean that municipal and county social service organizations will be called on to provide more services. Given the declining economic situation within the southern social impact area, this will mean that such services and funds will be increasingly scarce. To the extent that local municipalities and Fremont County provides services to residents of the Reservation, there could be a detrimental impact on their ability to provide these services.

CONFLICTS

RESOURCE PLANNING ACT (RPA) PROGRAM OBJECTIVES

Annual outputs for each alternative in the year 1995 were compared with the annual outputs and activities assigned to the Forest by RPA through the Regional Guide. Table IV-38 reflects these targets. The sample year 1995 was selected to reflect the situation and account for implementation in the early years of the Plan's implementation. A similar review was made to compare the

TABLE IV-39

Regional Guide Assignment of Outputs and Activities - Shoshone National Forest

	Unit of Measure[2]	1984	1985	Planning Period 1	2	3	4	5
RECREATION								
Developed Recreation Use (Including Visuals)	MMRVD	.40	.40	.50	.50	.60	.70	.80
Dispersed Recreation Use (Including Wildlife and Fish)	MMRVD	.70	.70	.70	.80	1.10	1.10	1.10
Trail Construction/ Reconstruction	MILES	64.0	71.0	79.0	76.0	74.0	70.0	65.0
WILDLIFE AND FISH								
Wildlife Habitat Improvement	MACRE Equivalents	17	16	14	12	10	6	6
RANGE								
Grazing Use (Livestock)	MAUM	87.0	87.0	87.0	87.0	88.0	88.0	88.0
TIMBER								
Programmed Sales Offered	MMBF	8.0	9.0	10.0	11.0	11.0	11.0	11.0
Reforestation	ACRES	200	150	200	200	200	200	200
Timber Stand Improvment	MACRES	.50	.50	.20	.10	.30	.30	.50
WATER								
Meeting Water Qualtiy Goals	MMAC-FT	2.70	2.70	2.95	3.05	3.10	3.10	3.10
MINERALS								
Minerals Leases and Permits	Operating Plans	52	54	59	68	78	131	92
HUMAN AND COMMUNITY DEVELOPMENT								
Human Resources Program[1/]	Enrollee Years	30	30	-	-	-	-	-
PROTECTION								
Fire Management Effectiveness Index	$/MACRES	261	260	254	254	254	252	251
Fuel Breaks and Fuel Treatments	MACRES	.3	.4	.5	1.0	.8	.8	.8

TABLE IV-39 (continued)

Regional Guide Assignment of Outputs and Activities - Shoshone National Forest

	Unit of Measure[2]	1984	1985	Planning Period 1	2	3	4	5
LANDS								
Land Purchase and Aquisition Excluding Exchange	MACRES	.400	.400	.150				
SOILS								
Soil and Water Resource Improvement (Improved Watershed Condition)	MACRES	.057	.057	.057	.057	.045	.045	.045
FACILITIES								
Road Construction/ Reconstruction (Arterial, Collector)	MILES	3.2	3.6	7.2	4.8	4.1	2.7	1.4

1/ Human Resource Programs are not included in figures beyond 1985.
2/ Units of Measure:

MMRVD = million recreation visitor days
MAUM = thousand cattle plus sheep animal unit months
MMBF = million board feet
MACRES = thousand acres
MMAC-FT = million acre-feet

projected total outputs between RPA and the alternatives. Alternative F is the RPA Alternative and was constructed to reflect RPA assigned objectives.

Developed Recreation

The maximum developed recreation produced in any of the benchmarks is 438 MRVD. Projected demand for developed recreation in 1995 is 404 MRVD. It appears that the RPA target of 500 MRVD is high by perhaps twenty percent. The RPA target should be 410 to 440 MRVD.

Dispersed Recreation (including Wildlife and Fish Use)

Total managed dispersed recreation capacity is 1400 to 1800 MRVD depending on the alternative. Projected demand for dispersed recreation for 1995 is estimated to be 780 MRVD. If demand were considered the target production level, the RPA target of 800 MRVDs seems to be slightly high.

Trail Construction/Reconstruction

Average annual new trail construction and major reconstruction is 2.5 to 3.0 miles, depending on the alternative. Average annual trail maintenance and minor reconstruction is about 130 miles. Each mile of trail is scheduled to be regularly maintained with enough dollars programmed to avoid major reconstruction. Accordingly, RPA target for trail construction and major reconstruction should be about three miles per year rather than 70 to 80 miles per year.

Wildlife and Fish Habitat

The maximum wildlife habitat improvement possible is approximately 467 actual acres per year. This is made up of aspen, sagebrush and willow treatments. How this relates to the RPA target in excess of 10,000 acre-equivalents is not clear.

Range (Livestock grazing)

Current livestock grazing capacity based on acres of suitable range and condition class is estimated to be 85,400 AUMs. The current permitted livestock use is 84,000 AUMs. The actual use in recent years has been about 65,100 AUMs. Given that actual use is well below current permitted use and capacity, the RPA target of 87,000 AUMs does not seem appropriate. All alternatives include range management systems and practices designed to bring rangelands closer to ecological capacity. These practices and managment systems can be implemented at an accelerated rate to reach a capacity of 87,000 AUMs by 1995. Given the amount of nonuse, there does not seem to be any justification for acclerating range improvements to reach 87,000 AUMs by 1995. RPA targets should be: 84,000 for 1986-1990,. 84,000 for 1991-2000, and 87,000 for 2001-2030.

Timber (Programmed Saled Offered)

The RPA targest in this category closely match the production levels in benchmarks and alternatives.

Reforestation

Annual regeneration harvest targets should be approximately: 425 acres for 1986-1990, 565 acres for 1991-2000, 755 acres for 2001-2010, 770 acres for 2011-2020, and 875 acres for 2021-2030. These acreages are the result of a nondeclining flow timber schedule which maximizes present net value and produces 10 to 11 million board feet per year. Almost all regeneration is achieved naturally and therefore acres actually planted is very small. It is unclear whether the RPA target relates to planted acres, regeneration harvest acres, or certified reforested acres.

Timber Stand Improvement

The RPA taregets in this category closely match the levels programmed in benchmarks and alternatives.

Water Meeting Quality Goals

Approximately eight percent of the Forest water yield is considered to be below water quality standards because of sedimentation from roads, livestock use close to streams and other non-point sources of pollution. Water meeting quality goals exceed the RPA target, but only because RPA underestimates the total water yield from the Forest. It is assumed in all alternatives that meeting quality standards is a prime objective; therefore, the output does not vary between them. RPA targets should be 3.32 MM acre-feet the first decade, 3.39 the second, 3.46 the third, and 3.54 the fourth and fifth decades.

Minerals Leases and Permits

Leases and permits are processed as applications are received. The numbers of applications received are not under the control of the Forest, so there should be no RPA targets in this resource area.

Fuelbreaks and Fuel Treatment

Average annual projected fuel treatment is approximately 255 acres. The RPA target of 500 to 1000 acres is much higher than projected needs. Fuel treatment needs correspond closely with regeneration harvest levels. An estimate of appropriate RPA targets is: 180 acres for 1986-1990, 200 acres for 1991-2000, 225 acres for 2001-2010, 225 acres for 2011-2020, and 250 acres for 2021-2030.

Soil and Water Resource Improvement (Improved Watershed Condition)

The Forest has a current inventory of about 201,000 acres in declining watershed condition. This inventory is incomplete. Programming only the inventoried acres for improvement work by the year 2000: the first decade target should be 67,100 acres; the second, 66,900 acres; and the third, 67,000 acres. Improved condition is not expected to be realized until the decade following that in which treatment took place. It is not clear how the RPA target was constructed, nor how and why it changes through time.

Facilities (Arterial and Collector Road Construction)

The RPA targets for arterial and collector road construction and reconstruction appear far in excess of needs projected by any alternative. As with trails, every mile of road is scheduled for regular maintenance with enough dollars programmed to avoid major reconstruction. Total road miles to be maintained are approximately: 300 miles at level 1; 900 miles at level 2; 245 miles at level 3; and 65 miles at level 4. Based on the proposed alternative, RPA targets for new construction and major reconstruction, in average annual units, should be 0.65 miles for 1986-2000, and zero miles for 2001-2030.

Returns to Treasury

The RPA targets of $1,112,000 per year (1982 dollars) are forty percent higher than the projected return to treasury of any of the alternatives. RPA target should be approximately $800,000 per year (1982 dollars).

Costs, Capital Investments and Total Appropriations

Average annual rates of capital investment are $540,000 to $600,000 (1982 dollars), which is approximately 12 percent of the total budget. This figure is for new investments only. Maintenance of existing investments is included mostly in operations cost and partly in long term fixed cost. Total appropriations needed to implement the alternatives (excluding reduced budget alternative) range from 4.25 MM$ to 5.3 MM$ (1982 dollars). The proposed alternative is about 4.5 MM$. This is well below the RPA target of 7.3 MM$ (1978 dollars) for 1995.

OBJECTIVES OF OTHER FEDERAL, STATE, COUNTY AND LOCAL GOVERNMENTS

Early in the planning process, interested and affected agencies at the different government levels were asked to list their concerns regarding the management of the Forest. The scoping effort also included informal contacts with other governmental agencies, contacting various civic groups, writing letters to agency personnel, administering a response form to selected agency personnel and members of the public, conducting in-service workshops, and soliciting District Rangers' expertise regarding network contacts in their areas.

A review of the written comments and informal surveys revealed some specific ares of concern.

- The Advisory Council on Historic Preservation indicated a need to continue to identify all areas of cultural or historical significance. None of the alternatives would reduce these activities below the level prescribed by law.

- State and county highway officials indicated that many Forest roads are substandard and unsafe due to increasing traffic volumes. All alternatives would provide the opportunity to upgrade roads. Alternatives A, B, D and F, with their emphasis on commodity outputs, would provide the most opportunity to upgrade roads.

- The Wyoming Game and Fish Department would prefer reduced road use in order to provide for more effective wildlife habitat. All alternatives emphasize wildlife management to some degree through closure of roads following management activities.

- The State Engineer's office has expressed general concern that the Forest Service could infringe on the right to develop water. Increased yields could help satisfy increasing domestic, agricultural and recreational demands on existing water supplies. Alternative B would increase water yields most. All alternatives give equal weight to potential development of water storage facilities and to protection of the Proposed Wild and Scenic River Corridor.

- The US Environmental Protection Agency expressed concerns regarding the effects of management on surface and ground water quality. It expects thorough and accurate data presented in an EIS, or in lieu of data, the development and implementation of a comprehensive water monitoring plan. The FEIS and Plan should address nonpoint sources of pollution and recommend best management practices to deal with them all alternatives incorporate these features.

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The relationship between the short-term uses of man's environment and the maintenance and enhancement of long-term productivity are complex. For the purposes of this assessment, short-term uses are those that generally occur on a yearly basis on some portion of the Shoshone National Forest such as livestock grazing as a use of the forage resource and recreation and irrigation as uses of the water resource.

Long-term refers to longer than a 10-year period. Productivity refers to the capability of the land to provide market and amenity values and for future generations. Soil and water are the primary factors of productivity and represent the relationship between short-term uses and long-term productivity. The quality of life for future generations will be affected by the capability of the land to maintain its productivity. Land allocations and permitted activities must not impair the long-term productivity of the land.

The alternatives incorporate sustained yield of resource outputs while maintaining productivity of the resources. Implementation of the specific direction and mitigation measures included in the Forest Direction and Management Area Direction would ensure that long-term productivity would not be impaired by the application of short-term management practices.

Alternatives A, B, D and F would have the highest level of short-term commodity-oriented uses and therefore would have higher levels of short-term consequences such as visual impacts and increased sedimentation. The risk of long-term impairment due to cumulative impacts is higher in these alternatives. The alternatives, in order of decreasing levels of short-term uses, are A, F, B, D, C and E, where C and E are substantially lower than any of the others. The risk of impairment in any alternative is local in nature and not Forest-wide, discounting the development of one or more major oil and gas fields on the Forest.

Effects of the alternatives would be monitored to provide data to assure that standards for long-term productivity are met. Monitoring requirements and standards would apply to all alternatives (See Chapter IV of the Forest Plan.)

ENERGY REQUIREMENTS

Estimates of energy consumption by alternative include energy used to provide goods and services on the Forest. These estimates are gross predictions, since few records or literature exist to develop energy consumption estimates for many of the Forest activities. Estimates for energy consumed were made for livestock grazing; recreation; timber activities; road construction, reconstruction and maintenance; and mineral exploration, extraction and transportation.

It was assumed that the energy consumption and yields from mineral activities would remain the same for all alternatives, since they are a function of demand and subsurface management, and outputs are not influenced by surface land management.

Some high gradient streams exist that would have potential for small, local hydroelectric development although the benefit-cost ratio would be low. Potential large hydroelectric reservoir sites on the Forest are limited. Most of the water flowing off the Forest is used for agricultural and domestic use. Although water yield varies by alternative, the variation is estimated to have a minor effect on present capability of the Forest to produce energy.

The production of oil and gas, and the utilization of residues that are currently burned to generate additional energy, is uncertain under the present economy. It may become significant as other sources diminish overtime. Public interest has increased significantly within the past few years in these energy sources, although to date they still remain primarily in the exploration and development stages.

Table IV-40 displays the predicted energy consumption by alternative.

TABLE IV-40

Predicted Energy Used by Alternative (Trillion BTU's - Total 50 Years)

	A	B	C	D	E	F
Energy Consumed for Outputs Produced	38	39	41	39	26	38

NATURAL AND DEPLETABLE RESOURCE REQUIREMENTS

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The term "irreversible commitment of resources" describes a loss of future options. It applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods of time. Measures to protect resources that could be irreversibly affected by other resource uses were incorporated in the Forest Direction management requirements and apply to all alternatives.

Extraction of mineral resources is an irreversible commitment of resources, since the minerals are no longer available for future use once they are extracted. Normally, the role of the Forest Service is to manage the surface resources to minimize adverse environmental impacts in the exploration and development of mineral resources. While extraction of gravel and rock for construction purposes can be considered an irreversible commitment of the resource, the amount of this use in relation to the total supply would be very minor and would not vary significantly among alternatives.

Irretrievable commitment of resources is defined as the loss of production or use of natural resources because of an allocation decision, or opportunities foregone for the period of time that a resource cannot be used. Allocation decisions that forego the production or use of renewable resources for relatively long periods of time include ski area development, road construction and developed recreation site construction. These commitments are irretrievable, in the sense that opportunities are foregone, rather than irreversible, since some could be reversed; although perhaps not without great expense.

A decision not to harvest trees on steep slopes not economically accessible represents an opportunity foregone, since mortality is not salvageable. The commitment is irretrievable rather than irreversible, because future technological advances could make harvest of these trees economically feasible.

The difference between outputs and effects under a given alternative and the higher levels that could otherwise be produced also represents an irretrievable commitment of resources. For example, a low level of forage use for livestock grazing or a low level of water yield could be increased in the future based on the application of different management area prescriptions, but the outputs between now and then would be "lost" or not available for use. Therefore, the maintenance of future options and the present ability to use the resources to the fullest often conflict with one another. One purpose of Forest planning is to provide a mix of uses and set a course that balances the needs of both current publics and future generations.

The above considerations are generalized, applying to some degree in all alternatives. Decisions regarding resource use or nonuse in each alternative represent irretrievable commitments of resources, but the time in which the commitments are reversed is variable. For example, a decision to manage an area for nonmotorized recreation or not to allow domestic livestock grazing in an area represents an irretrievable commitment of resources which can be reversed in a relatively short period of time. Harvesting a mature stand of timber means that the habitat provided for old growth dependent species of wildlife is lost for the period of time required to grow another mature stand; the loss is reversible, but not for 100 to 120 years. By most reasonable standards, such an effect would be termed irreversible. The amount of land area involved in long term irretrievable, but reversible, commitments of resources through such actions as timber harvest and road and facility construction is minor, Forest-wide, though these can have dramatic local effects.

Though past levels of oil and gas exploration and development opportunities have also been minor on the Forest, recent trends indicate that such activities could increase significantly over the next ten years. Such activities involve irretrievable commitments of both surface and subsurface resources. Placement of a well in an area can cause a loss of some types of visual and recreation opportunities, and production of oil and gas from a well causes loss of the mineral resource from the Forest. This commitment of subsurface resources is plainly irreversible. Most, if not all, of the losses of surface resources can be reversed if there are no accidents such as spills or pipeline breaks, or if access roads and facilities fit the capability of the land for rehabilitation. If an exploratory well does not find producible quantities of oil or gas, losses can be reversed in a relatively short period of time through complete rehabilitation of the well site and access roads. Where production of oil or gas is initiated, the losses can be reversed through similar actions, but only after production ceases in 10 to 50 years. Full field development, involving a number of wells and roads, could delay total rehabilitation in an area for an indefinite period of time. As with timber harvesting, the lengthy time span required to return an area to its former condition may be considered an irreversible commitment depending on what is considered a "reasonable amount of time" for rehabilitation.

With production of oil and gas, unlike other uses of the Forest, there is a risk of loss of some surface resources beyond a reasonable or forseeable amount of time. This can happen through such accidents as spills, pipeline breaks or leaching of toxic chemicals that could affect soil productivity, vegetation, water quality and aquatic habitat. The chance of such accidents is partially dependent on the standards under which operations are conducted. Though the chances of major accidents causing irreversible effects may be slight, there is concern over this possibility.

An issue of major concern to many users of the Forest is the commitment of resources for oil and gas exploration and development. About 40 percent of the Forest is available for oil and gas leasing and development opportunities. This means that the potential impacts of oil and gas activities could affect a significantly larger proportion of the Forest than development or use of any other marketable Forest resource such as timber or livestock forage. For this reason, alternatives vary in their treatment of oil and gas. All alternatives include provisions for protection of some surface resources, at least at levels considered minimally acceptable, on affected sites. All alternatives allow for exploration and development of all areas available for oil and gas leasing, according to appropriate lease stipulations.

Alternatives C and D, however, include more stringent recommended operating standards that would minimize the loss of such resources as dispersed nonmotorized recreation settings, visual quality, and wildlife habitat. They also reduce the risk of cumulative impacts on soil, water, and related aquatic values that would be irreversible or irretrievable. These alternatives provide the lowest opportunity cost in terms of surface resource commitments, in line with its intent to emphasize noncommodity values.

The development of roadless areas represents an irreversible commitment of potential wilderness resources. Each of the alternatives involves development in some roadless areas. Providing a balanced mix of recreation opportunities is a prime consideration in the design of Alternatives C and D. Therefore demand for wilderness recreation was considered in these alternatives. In addition, Congress evaluated demand for wilderness in passage of the Wyoming Wilderness Act of 1984 and established in the Act that areas not designated wilderness were to be managed for multiple-use and need not be managed to preserve wilderness character. However, many of the roadless areas will remain essentially undeveloped in all alternatives.

OTHER RESOURCE REQUIREMENTS

The levels of output for each resource were detailed and support elements were discussed previously in the section Direct, Indirect and Cumulative Environmental Effects. No additional resource requirements were identified.

HISTORIC AND CULTURAL RESOURCES

The goal of the Forest Service's cultural resource management program is to preserve significant cultural resources in their original location. The ultimate goal is to ensure that such resources remain available on a long-term basis in reasonably unaltered field situations for such uses as research, recreation, education and social and cultural purposes. Alternatives were evaluated regarding their direct and indirect effects on cultural resources in relation to the stated goal.

Criteria of adverse effects on listed or eligible National Register of Historic Places properties, established in 36 CFR 800, provide a suitable basis for effects comparison. These criteria are:

- Destruction or alteration of all or part of a property.
- Isolation from or alteration of the property's surrounding environment.
- Introduction of visual, audible or atmospheric elements that are not in character with the property or its setting.
- Neglect of a property resulting in its deterioration or destruction.
- Transfer or sale of a property without adequate conditions or restrictions regarding preservation, maintenance or use.

The first four criteria are the most relevant to this analysis.

Those alternatives that would allow for a high degree of land-disturbing or altering activities would have a relatively higher potential for adversely affecting cultural resource, directly or indirectly, than alternatives which minimize such activities. However, the adverse effects potential of even a high disturbance alternative would be reduced, and often totally eliminated, by planning activities to avoid areas of high cultural resource sensitivity and compliance with standards and guidelines contained in the Plan's Forest Direction.

ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Implementation of any of the alternatives would result in some adverse environmental effects that cannot be avoided. However, application of the management requirements in Chapter III of the Plan is intended to limit the extent and duration of these effects, or to ensure that legal minimum standards are met. Monitoring and implementation procedures given in Chapter IV of the Plan are key to ensuring proper application of requirements and minimizing adverse effects.

The degree or severity of the adverse effects can be minimized by adhering to the direction in the management area prescriptions, but some impacts cannot be avoided. These effects include:

Fire Management

Subsequent to logging and thinning operations, there will be temporary increases in fire hazard and control difficulty due to timber residues. Also, the fire risk will increase as a result of more people using an area during and after management activities. This effect will be mitigated by earlier detection and suppression, resulting in more fires controlled at small acreages. In the long term, fire hazard will be decreased through vegetation management activities as areas with accumulated natural fuels are put under management, and fuel continuity is reduced.

Air Quality

The air quality will diminish on a local and temporary basis due to various management activities. Burning timber harvest debris piles, timber hauling and recreation traffic on untreated roads and the operation of internal combustion engines will adversely impact the air quality where these activities occur.

Impacts on air quality related values in Class I areas could be categorized as both irreversible or irretrievable resulting from the long term cumulative effects of airborne pollutants whose source is outside wilderness, on or off the Forest.

Water Quality and Wetlands

Sediment resulting from management practices is considered the most prevalent pollutant material in Forest streams. Project activities such as road building and use, vegetation management and soil disturbance will contribute sediment to adjacent streams. In some instances, short term reduction of water quality may violate state water quality standards. In other cases, where it may not be practical to build roads outside of wetlands or floodplains, Forest Service goals for water quality maintenance or enhancement may not be met (FSM 2520).

Grazing of domestic and transportation livestock in riparian areas could adversely affect the hydrologic and physical character of such areas and induce physical, chemical and biological changes in water quality. Developed and dispersed recreation can contribute to the same adverse effects. Some such impacts are unavoidable without comprehensive programs of monitoring and administration, and full time commitment of administrative personnel.

Minerals activities, including oil and gas, will produce some of the same adverse impacts as above, but in addition holds the potential for pollution by toxic or other hazardous materials. Spills and leaks of hazardous materials during development and production of oil and gas are unavoidable to a degree. In many areas of the Forest, spills and leaks would unavoidably affect water quality or wetland character.

Soils

Loss of vegetation cover, soil compaction and erosion will occur in some areas in association with road construction, timber harvest, grazing or other developments. Adequate project planning and soil program management would limit effects to acceptable levels.

Wildlife

Increased human activities in project areas may temporarily disturb or displace wildlife. Roads and road use may have a longer lasting impact on wildlife due to human activities associated with access into areas that were previously unroaded, or improved access into areas that previously had low standard unsurfaced roads.

Mineral development will cause a direct loss of wildlife habitat on the Forest for the duration of the activity. Measures will be taken to mitigate the loss of habitat following mining.

Fisheries

Road building and use, timber harvest and other ground disturbing activities will increase silt loads in streams which may temporarily displace fish, reduce trout reproductive success and alter aquatic microinvertebrate populations in stream sections receiving heavy concentrations.

Livestock Forage

Riparian area protection would remove some areas that are presently grazed from term permitted use by livestock.

Coal and uranium mining and gas and oil development will affect livestock forage for ten to fifty years as these acreages are removed from production. Mitigation measures will provide for establishment of forage on these areas to equal or exceed pre-mining levels.

Timber harvesting or timber stand improvement in natural barriers may affect livestock distribution and control, and could cause a need for additional range structural improvements.

Tree Stand Management

Some trees will be lost to mortality and others will not be harvested due to old growth requirements for wildlife, soil protection on steep slopes, riparian area protection and other Forest Direction.

V. LIST OF PREPARERS

CHAPTER V

LIST OF PREPARERS

The Shoshone National Forest Land and Resource Management Plan and the Environmental Impact Statement were prepared by a team of individuals with varied specialists and backgrounds. Throughout the planning process, an interdisciplinary approach was used to develop the Plan and alternatives to it. The following are those who helped in the preparation of the documents. Individuals described as serving as "core team members" were involved in all aspects of the Plan.

Mark Bickham - Engineering Draftsman

Northern Montana State, Missouri Southern State

Major responsibility for all maps for the Forest Plan and Environmental Impact Statement. Also responsible for all graphics and art work.

Barry Burkhardt

B.S., Geology, University of North Dakota.

Seven years of experience on the Custer National Forest as assistant Minerals Staff Officer and district geologist. Previous experience included a one year appointment as field geologist for Power Resources Corporation, a mineral exploration company.

David Dillard - Operations Research Analyst

B.S., Forest Management; M.S., Regional Resource Planning; M.B.A., Finance

Two years in the Region 2 office as operations research analyst. Previous experience includes two and a half years as operations research analyst on the White River National Forest.

Carol Fordham - Typist

Major responsibility for typing the Environmental Impact Statement and the Forest Plan.

Randall Hall - Forest Supervisor

B.S., Forest Management, University of Missouri

Employed by the Shoshone National Forest for fourteen years, including six and one half years as Forest Supervisor, three and one half years as Recreation, Lands and Range, and Wildlife Staff, and four and one half years as District Ranger. Two years as a Range Conservationist in the Washington Office of the Forest Service and currently the Director of Range and Watershed in the Regional Office of the Intermountain Region. Other experience includes District Ranger, Winema National Forest; Program Manager, Pike and San Isabel National Forests; Job Corp Center Director, San Juan National Forest; and Forester, Roosevelt National Forest.

Robert Hammond - District Ranger, Lander District

B.S., Forest/Timber Management, University of New Hampshire

Employed by Shoshone National Forest for one year as a District Ranger. Previous experience includes District Ranger and Resource/Timber assistant on the Targhee, Lolo, Black Hills, Roosevelt and Rio Grand National Forests.

Claire Huking - Forester

B.S., Outdoor Recreation, Colorado State University, M.S., Land Use and Resource Planning, Texas Tech. University

One year experience in planning on the Shoshone National Forest. Previous experience includes Recreation and Lands Forester on the Routt National Forest. Member of the Core interdisciplinary team. Areas of responsibility included social, recreation, wilderness, lands and special uses.

Frank Jackson - Operations Research Analyst

B.S., Watershed Science, Colorado State University, M.S., Earth Resources, Colorado State University

Two years experience on the Shoshone National Forest. Previous experience includes Hydrologist on the Klamath National Forest. Member of the Core interdisciplinary team. Areas of responsibility included program formulation and data base management.

Toby Jordan - Typist

Major responsibility for typing the Environmental Impact Statement and Forest Plan.

Ted Knowles - District Ranger, Wind River District

B.S., Range Management, University of Nevada - Reno.

Six years as District Ranger on the Shoshone National Forest. Previous experience included seven years as a District Ranger on the Dixie National Forest, and five years as assistant Ranger on the Cache National Forest. Early training and experience as a Range Conservationist was gained on the Humboldt National Forest.

Mike Lloyd - District Ranger, Greybull District

B.S., Outdoor Recreation Administrtion, Colorado State University. District Ranger on the Shoshone National Forest. Previous experience included seven years on the Pike and San Isabel National Forest as YCC/YACC director, forester and recreation forester. Two years were spent as a soil scientist for the Pike and San Isabel Forest and the Soil Conservation Service.

Melanie Malespin - Wildlife Biologist, Rocky Mountain Region

B.S. and M.S. in Wildlife Management, Utah State University.

Seven years experience in wildlife management with the Forest Service on Ranger Districts, Supervisor's Offices, and now at the Regional Office. Provided input on wildlife analysis.

Charles McConnell - Recreation Forester, Rocky Mountain Region

B.S., Forest Recreation, Colorado State University. Graduate, Forest Service Recreation Short Course, Utah State University.

Forester of Recreation, Rocky Mountain Region, Denver. Eight years recreation management and planning, ten years Prinicipal Resource Staff Officer, Recreation and Land Uses, on two National Forests. Four years Winter Sports Planning and Management, Regional Office. Five years Recreation Planning and Management and Wilderness Management, Regional Office. Member Regional Office I.D. team.

Stephen Mealey - Forest Supervisor

B.A, Political Science, University of Oregon; B.S. Forestry, University of Idaho; M.S., Wildlife Management, Montana State University.

Forest Supervisor of the Shoshone National Forest. Previous exerience includes four years as intelligence officer for the United States Air Force, four years as guide and outfitter in Idaho, and two years researching grizzly bears in the Greater Yellowstone Area. Other experience includes three years as a planning specialist with both the Arapaho Roosevelt National Forest and the Washington Office; and three years as a wildlife biologist on the Shoshone National Forest.

Richard Miller - Civil Engineer

B.S., Civil Engineering, University of Nebraska.

Employed by the Shoshone National Forest for ten years. Previous experience includes Civil Engineer on the Routt and Rio Grande National Forests. Area of responsibility was transportation.

Thomas Mitchell - Planning Staff Officer

B.S. Aerospace Engineering, Iowa State University; M.P.P., Public Policy Studies, University of Michigan; Candidacy of Philosophy, Natural Resource, Economics, Policy and Administration, University of Michigan; Ph.D., Natural Resources Policy, Planning and Management, University of Michigan.

Employed by the Shoshone National Forest for two and a half years. Previous experience includes Regional O.R.A. in Region 9, Planning Specialist in W.O. Land Management Planning and Assistant Professor of Forest Economics and Management at Ohio State University. Area of responsibility included overall development of analysis models, the EIS and Forest Plan, timber, social and economics.

Donald Musso - District Ranger, Clark's Fork Ranger District

B.S., Forest Recreation, Colorado State University

Employed by the Shoshone National Forest for eight years as District Ranger. Previous experience includes nine years as a forester on the San Juan, Pike and San Isabel National Forests.

Theresa Pike - Computer Operator

Major responsibility was typing and entering data into computer models.

Thomas Portice - District Ranger, Wind River District

B.S., Forest Range Management, Colorado State University

Employed by the Shoshone National Forest for one year as a District Ranger. Previous experience includes District Ranger and Resource Assistant on the Arapaho and Roosevelt National Forests and Timber Management Assistant and Timber Forester on the Black Hills National Forest. Participated as a Management Team member. Helped to develop management concerns, directed District public involvement, provided direction for "on-the-ground" application of the Forest Plan, and verified land use allocations.

Charles "Bud" Riggs - Recreation Forester

B.S., Forestry/Timber Management, University of Idaho

Six years experience on the Shoshone National Forest. Previous experience includes Assistant Recreation Officer on the Sierra National Forest, and Forests and Timber Management Assistant on the Lassen National Forest. Area of responsibility included RARE II analysis and recration data base formulation.

John Ross - District Ranger, Greybull Ranger District

B.S., Range/Wildlife Management, University of Arizona

Six years experience as District Ranger on the Shoshone National Forest. Previous experience includes Wildlife Biologist on the Gila, Coronado and Shoshone National Forests and Range Conservationist on the Gila National Forest. Currently employed as a Wildlife Biologist on the Carson National Forest. Participated as a Management Team member. Helped to develop management concerns, directed District public involvement, provided direction for "on-the-ground" application of the Forest Plan, and verified land use allocations.

Larry Ross - Soil Scientist

B.S., Soils and Forestry, Washington State University

Employed by the Shoshone National Forest since 1979. Previous assignments includes eleven years experience as a soil scientist on the Nez Perce and Flathead National Forests and with the Soil Conservation Service. Member of the core interdisciplinary team. Areas of responsibility included soil and vegetation and land productivity.

Robert Rossman - Hydrologist

B.S., Watershed Science/Hydrology, Colorado State University

Employed by the Shoshone National Forest since 1980. Previous assignments include District Hydrologist on the Klamath National Forest and Hydrologist with the U.S. Geologic Survey in Atlanta, Georgia. Member of the core interdisciplinary team. Areas of responsibility include soil, water, air, and Wild and Scenic rivers.

John "Jack" Sanders - Wildlife Biologist

B.S., Forestry, Montana State University

Nine years experience with the Shoshone National Forest, including four years as Wildlife Biologist in the Supervisor's Office and five years as Range Conservationist on the Wind River District. Previous experience includes Range Conservationist on the Routt National Forest and Forester/Assistant Ranger on the Medicine Bow National Forest. Member of the core interdisiplinary team. Areas of responsibility included Wildlife and Fish, Range and Fire.

Ollie Scott - Forester

B.S., Forest Managemet, Colorado State University

Eighteen years experience on the Shoshone National Forest, including six years on the Wind River District and twelve years in the Supervisor's Office. Previous experience includes eight years on the Arapaho and South Tongass National Forests as a Forester. Area of responsibility was Timber Management.

Michael Snyder - Landscape Architect

B.L.A., Landscape Architecture, Kansas State University

Five years experience on the Shoshone National Forest. Previous experience includes Landscape Architecture on the Medicine Bow National Forest and with the Kansas Park and Resource Authority. Member of the Core interdisciplinary team. Areas of responsibility include recreation, visual management, wilderness, lands and special uses, transportation, cultural resources, minerals and data management.

Dave Stark - District Ranger, Lander Ranger District

B.S., Forest Management, Purdue University

Three years experience as District Ranger on the Shonshone National Forest and one year experience as the Shoshone Forest Planner. Currently employed as District Ranger on the White River National Forest. Previous experience includes twelve years as a Forester on the Grand Mesa, Uncompahgre and Gunnison National Forests and on the Black Hills and Routt National Forests. Participated as a Management Team Member. Helped to develop management concerns, directed district public involvement, provided direction for "on-the-ground" application of the Forest Plan and verified land use allocations.

Edna Upton - Typist

Major responsibility for typing the Environmental Impact Statement and Forest Plan.

Linda Webster - Computer Operator

Major responsibility for maintenance of word processors and printers.

Ronald Wilcox - District Ranger, Wapiti Ranger District

B.S., Forest Management, Southern Illinois University

Three years experience as District Ranger on the Shoshone National Forest. Previous experience includes district primary staff in timber, recreation, minerals and special uses, and logging systems specialist on the San Juan National Forest and Forester on the Gifford Pinchot, Siuslaw and Mt. Baker-Snoqualmie National Forests. Participated as a Management Team member. Helped to develop management concerns, direct District public involvement, provided direction for "on-the-ground" application of the Forest Plan, and verified land use applications.

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Plan Formulation
- Monty Barker, Wildlife Biologist
- Don Campbell, Planner
- Sharon Nygaard-Scott, Forester
- Michael Smith, Forester
- Dianne Spencer, Ranger Conservationist
- Mark Storey, Hydrologist
- Mike Thomas, Computer Analyst
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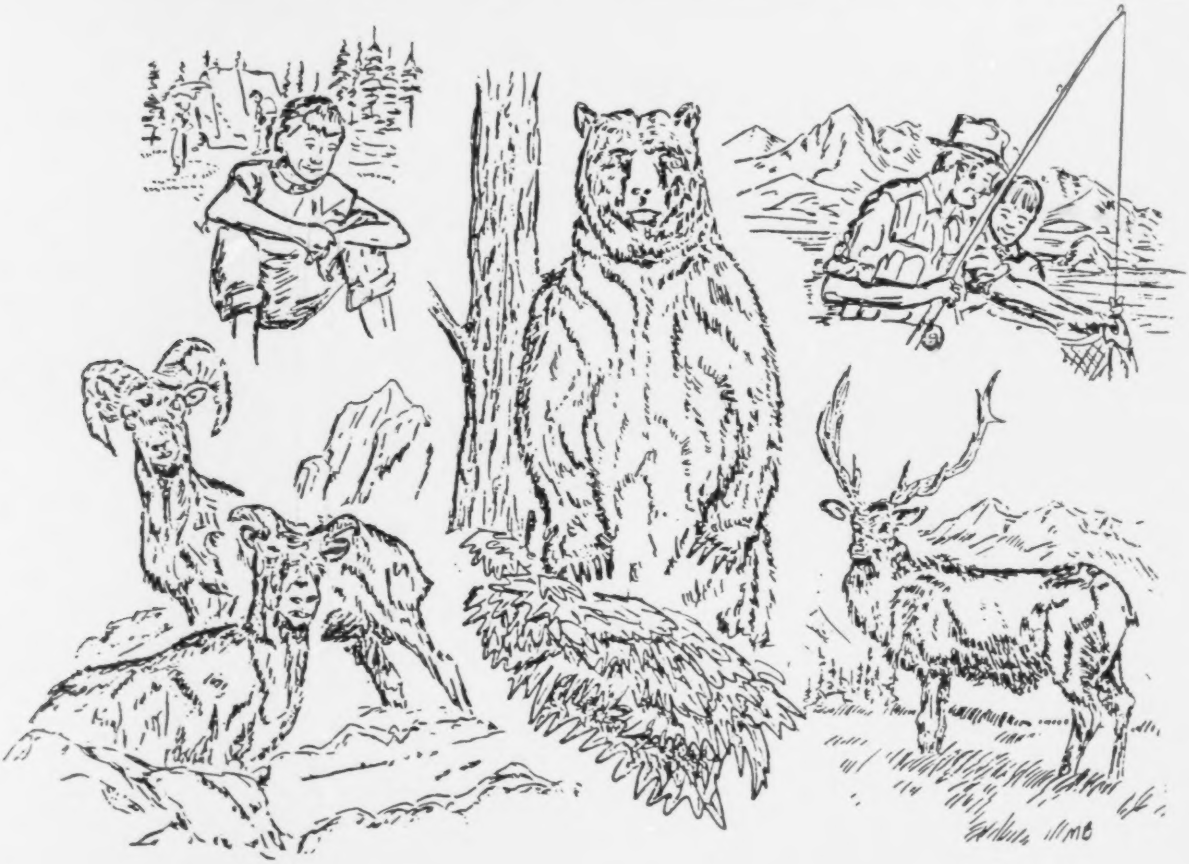

VI. CONSULTATION WITH OTHERS AND MAILING LIST

(SEE VOLUME II)

VII. GLOSSARY

-A-

ACCELERATED EROSION - See EROSION

ACRE-FOOT - A water measurement term equal to the amount of water that would cover an area of one acre to a depth of one foot (43,500 cubic feet or 325,850 gallons).

ACTIVITY - A measure, course of action or treatment that is undertaken to directly or indirectly produce, enhance or maintain forest and rangeland outputs or achieve administrative or environmental quality objectives. FSH 1309.11, The Management Information Handbook sets forth Forest Service activity definitions, codes and units of measure.

ACTIVITY TYPE - The further description of the measure course of action or treatment within an activity. See FSH 11209.11 for definitions of activity types.

AGGRADATION - A condition of disequilibrium in a stream in which more sediments is depositied than can be removed. The opposite condition is one of degradation.

AIR QUALITY RELATED VALUES - Those values which are dependent upon air quality for their maintenance and protection. They include visibility, odor, soil, water, vegetation, wildlife and geological features.

AIR QUALITY STANDARDS - Standards prescribed and enforced by the Wyoming Department of Environmental Quality under the authority of the Wyoming Environmental Quality Act and the Clean Air Act. Airsheds are classified into three types (I, II and III); standards are designated for each class. Class I airsheds are those in which minute pollution increases above baseline are allowed, but no allowance is made for adverse impacts on "air quality related values". Moderate increases in air pollution are allowed in Class II areas.

ALLOWABLE SALE QUANTITY (ASQ) - The quantity of timber that may be sold from the area of suitable land covered by the forest plan for a time period specified by the plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity". (36 CFR 219.3)

ALLUVIAL DEPOSITS - See ALLUVIUM

ALLUVIUM - Material, including clay, silt, sand, gravel and mud, deposited in riverbeds, lakes, alluvial fans, valleys and elsewhere by modern streams. Accumulations are referred to as alluvial lands.

ALTERNATIVE - One of several policies, plans or projects proposed for decision making.

AMENITY - A term describing values and characteristics relating to a personal or social phenomenon and the psychological well-being of persons affected by National Forest System management. These values and characteristics are above and beyond those required to satisfy the basic biological needs for food, water and shelter.

ANALYSIS AREA - An area of land delineated for purposes of analysis of possible management practices and possible production, enhancement, or maintenance of forest and rangeland outputs and environmental quality objectives.

ANALYSIS AREA PRESCRIPTION - A coordinated set of practices for a specific area of the Forest. The same as a FORPLAN PRESCRIPTION or FORPLAN RX. Such a prescription includes the costs of each practice and estimates of outputs and effects which would result from application of the listed practices to a specific area.

ANIMAL UNIT MONTH (AUM) - The amount of feed or forage required by an animal unit (considered to be one mature 1,000 pound cow or the equivalent based upon average daily forage consumption of 26 pounds dry matter per day) for one month.

ANNUAL PROGRAMMED SALE QUANTITY - The portion of the Allowable Sale Quantity that is programmed for a specific year. It is based on current demand for wood products, funding, silvicultural needs and practices, and multiple-use objectives.

AQUIFER - A geologic formation or structure that transmits water in sufficient quantity to supply the needs for a water development, such as a well. The term "water-bearing" is sometimes used synonymously with "aquifer" when a stratum furnishes water for a specific use. Aquifers are usually saturated sands, gravel, fractured rock or cavernous and vesicular rock.

ARTERIAL ROADS - Roads which provide service to large land areas and usually with public highways or other Forest arterial roads to form an integrated network of primary travel routes.

ARTESIAN FLOWS - Water flowing to the ground surface from an aquifer due to underground hydrostatic pressure.

AVAILABLE FOREST LAND - Those portions of the Forest not administratively or legislatively excluded from use for timber harvest or livestock grazing. See TIMBER SUITABILITY CLASSIFICATION

AVALANCHE ZONE - An area having a high potential for avalanches as evidenced by past activities.

-B-

BACKGROUND - The distant part of a landscape located from three to five miles to infinity from the viewer.

BASAL AREA - The cross-sectional area of a stand of trees measured at breast height. The area is expressed in square feet per acre.

BASE SALE SCHEDULE - A timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and this planned sale and harvest for any decade is not greater than the long-term sustained yield capacity. (36 CFR 219.3)

BASE TIMBER HARVEST SCHEDULE - The timber harvest schedule in which the planned sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade of the planning period, provided that this harvest quantity is not greater than the long-term sustained yield capacity.

BEDLOAD - The sediment in a stream channel that moves mainly by saltating, sliding, or rolling on or very near the bottom of the stream.

BENCHMARK - A scheme for management of the Forest which focuses on one or a select few forest conditions, resource outputs, or public issues. Benchmarks generally maximize of minimize particular conditions or outputs in order to establish a range of production possibilities.

BENEFICIAL USE - A use of waters of the state that may be protected against quality degradation, including but not necessarily limited to domestic, municipal, agricultural and industrial supply; and preservation and enhancement of fish, wildlife and other aquatic resources or preserves.

BENEFIT/COST RATIO (B/C Ratio) - The total value of all monetary and nonmonetary benefits divided by the total discounted costs required to produce those benefits.

BENEFIT - The value of a positive or desirable output or effect resulting from an activity, project, or program.

BEST MANAGEMENT PRACTICE - A practice or a combination of practices, that is determined by a State (or designated area-wide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic and institutional consideration) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

BIOLOGICAL EVALUATION - A review of each program or activity authorized or carried out by the Forest Service in sufficient detail to result in a decision that the action may affect or will not affect a federally classified species.

BIOLOGICAL GROWTH-POTENTIAL - The average net growth attainable in a fully stocked forest stand (36 CFR 219.3).

BMP - Best Management Practices

BOARD FOOT (BF) - The amount of wood contained in a board one inch thick, 12 inches long and 12 inches wide.

BRAIDED CHANNEL -A relatively wide stream or riverbed, composed predominantly of rock, gravel and silt, containing several channels that cross each other in a braid-like pattern.

BTU (British Thermal Unit) - The amount of energy required to raise one pint of water one degree Fahrenheit. There are approximately six million BTU's in a barrel of oil, 1,000 BUT's in a cubic foot of natural gas.

CANOPY - The cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

CAPABLE LANDS - Those portions of the Forest that have an inherent ability to support a resource. For example, lands that are capable of producing harvestable timber must produce at least 20 cubic feet per acre per year of wood fiber.

CAPABILITY - The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given levels of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices, such as silviculture or protection from fire, insects and disease. (36 CFR 219.3)

CAPABILITY AREA - Geographic delineations used to describe characteristics of the land and resources in integrated forest planning. Capability areas may be synonomous with ecological land units, ecosystems or land response units.

CAPITAL INVESTMENT - An input that increases the stock of natural or manmade resources (assets) needed to maintain or increase the flow of outputs in the future. Benefits resulting from capital investments are normally recouped in excess of one year.

CARRYING CAPACITY - In range management it is the maximum stocking rate possible without inducing damage to vegetation or related resources. In wildlife management it relates to the maximum number of individual animals that can survive the greatest period of stress each year on a given land area. In recreation management it is the maximum human use an area can sustain on a long-term basis without unacceptable physical (ecological) deterioration or psychological crowding.

CELL (Elk or Bighorn sheep) - An area which contains populations or subpopulations of wildlife and is traditionally used each year.

CEQ - Council on Environmental Quality.

CFR - Code of Federal Regulations.

CLASS I AIR - See AIR QUALITY STANDARDS

CLASS I WATERS - See WATER QUALITY STANDARDS

CLEARCUTTING (CC) - The harvesting in one cut of all trees in an area for the purpose of creating a new, even-aged stand. The area may be a patch, stand or a strip large enough to be mapped or recorded as a separate age class.

COLLECTOR ROADS - These roads serve smaller land areas than do the arterial roads and are usually connected to a Forest arterial or public highway. They collect traffic from Forest local roads or terminal facilities.

COLLUVIUM - Mixed deposits of soil material and rock fragments accumulated near the base of steep slopes through soil creep, landslides and local surface runoff. Accumulations are referred to as colluvial slopes.

COMMERCIAL SPECIES - Tree species suitable for industrial wood products.

COMMERCIAL THINNING - Cutting in immature stands to improve the quality and growth of the remaining stand. Trees removed in the thinning are used for sawtimber or products (poles, posts, props, fuelwood, etc.).

COMMERCIAL TIMBER SALES - The selling of timber from National Forest lands.

COMMODITY - A good, product or service which can be traded in the marketplace.

COMPLEX PLANNING ACTION - A planning action in which individual components require separate decisions. (See FSM 1970.62)

CONFINE - To restrict the fire within determined boundaries established either prior to the fire, during the fire, or in an escaped fire situation analysis.

CONGRESSIONALLY CLASSIFIED AND DESIGNATED AREAS - Areas which require Congressional enactment for their establishment such as Wilderness, National Wild and Scenic Rivers, National Recreation Areas, or National Scenic Trails.

CONSTRAINED - To keep within some measurable bounds.

CORRIDOR - A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries. (36 CFR 219.3)

COST - A measure of the inputs (land, labor, money, energy) required to produce a good, product, service or use.

COST, CAPITAL INVESTMENT - The cost of man-made structures, facilities or improvements in natural resources used as inputs in production processes to produce outputs over one or more planning periods.

COST EFFECTIVE - Achieving specified outputs or objectives under given conditions for the least cost.

COST EFFICIENCY - A portion of economic efficiency analysis which examines alternative methods (costs) of producing a given set of outputs (benefits). Cost efficiency is usually measured using present net value, although use of benefit-cost ratios and rates-of-return may be appropriate.

CONTAIN - To surround a fire, and any spot fires therefrom, with control line, as needed, which can reasonably be expected to check the fire's spread under prevailing and predicted conditions.

CONTROL - To complete the control line around a fire, any spot fires therefrom, and any interior islands to be saved; burn out any unburned area adjacent to the fire side of the control line; and cool down all hot spots that are immediate threats to the control line, until the line can reasonably be expected to hold under foreseeable conditions.

COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) - An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies and advises the Presiodent on environmental matters.

COVER, HIDING - Vegetation capable of hiding 90 percent of a standing adult deer or elk from the view of a human at a distance equal to or less than 200 feet.

COVER, THERMAL - Cover used by animals for protection against effects of weather.

CRUCIAL PREFERRED WINTER RANGE (CPWR) - An area within CWR where concentrations of animals can be found each year during the period of January 1 to March 31. These areas are considered essential for the welfare and maintenance of the dependent populations.

CRUCIAL WINTER RANGE (CWR) - An area where 75 percent of the individuals in a population can be expected to be found during periods of inclement weather from January 1 through June 30 each year.

CULTURAL RESOURCES - The places, sites and objects associated with events, activities or persons important to the history or prehistory of an area. Also included are native American religious or sacred sites or concepts assoiciated with an area.

CUMULATIVE IMPACTS - Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result frcm individually minor but collectively significant actions taking place over a period time (CEQ Regs).

CUTTING CYCLE - The planned, recurring lapse of time between successive cutting in a timber stand.

CUTTING METHODS - The tree stand manipulation practices employed to obtain a regenerated stand or improve the growth and form of immature stands. Cutting methods in even-aged silviculture include clearcutting, and various shelterwood cuts such as seed tree cutting and overstory removal cutting. Cutting methods in the uneven-aged silviculture include single-tree selection and group selection. Intermediate cutting include precommercial thinning, commercial thinning, cleaning, weeding and release.

-D-

DEFERRED GRAZING - Grazing is delayed or discontinued on an area or unit for a specified period of time to provide for plant reproduction, establishment of new plants, or restoration of vigor of existing plants.

DECISION UNIT - The smallest component of an alternative for which relevant inputs (costs) and outputs (benefits).

DECISION VARIABLE - A component of an alternative in which activities and their costs, outputs and benefits are identified and used for analysis and decision making. All activities and costs are necessary to accomplish the outputs and benefits are included. See FSH 1309.11 for decision variable definitions and codes.

DEGRADATION - A condition of disequilibrium in a stream in which more sediment is removed than is depositied. This condition is characterized by downcutting and channel bank erosion, and is similar in nature to gully development.

DEMAND - The amount of an output that users are willing to consume at a specified price, time period, and condition of sale.

DEMAND ANALYSIS - A study of the factors affecting the schedule of demand for an output, including the price-quantity relationship if applicable.

DEMAND SCHEDULE (Curve) - A schedule of quantities of an output that users are willing to consume at a range of prices, at a given point in time, and conditions of sale. See PRICE/QUANTITY RELATIONSHIP

DEPARTURE - A schedule which deviates from the principle of nondeclining flow by exhibiting a planned decrease in the timber sale and harvest schedule at any time in the future.

DEPREDATION - The act of inflicting damage to private property caused by big game or trophy animals (livestock, land, crops, improvements or extraordinary damage to grass).

DEVELOPED RECREATION - That type of recreation which occurs at man-made developments such as campgrounds, picnic grounds, resorts, or ski areas.

DEVELOPED SITE - A tract of land modified with facilities such as parking lots, tables, sanitary systems, to accommodate intensive type recreation activities by providing comforts and conveniences as well as safety and sanitation for the users.

DHB (Diameter at Breast-Height) - The diameter of a standing tree at a point four feet, six inches from ground level.

DIRECT IMPACT - Impacts which are caused by an action and occur at the same time and place.

DISCOUNTING - An adjustment, using a discount rate for the values of money over time, so that costs and benefits occurring in the future are reduced to a common point in time, usually the present, for comparison.

DISCOUNT RATE - An interest rate that represents the cost or time value of money in determining present value of future costs and benefits.

DISPERSED RECREATION - That type of outdoor recreation which tends to be spread out over the land such as hunting, fishing, snowmobiling, hiking, driving for pleasure, cross-country skiing, motorbiking, mountain climbing and other activities.

DISTANCE ZONE - One of three categories used in the Visual Management System to classify a view into (1) forground, (2) middleground, and (3) background.

DIVERSITY - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan. (36 CFR 219.3(g) NFMA Regulations)

DOMESTIC WATER USE - Use of water for household cooking and bathing. Such uses are consistent with campers' needs.

DOT - Department of Transportation.

-E-

EASEMENT - A right that one may have on another's land. In the petroleum industry, it usually refers to the right given by the landowner for a pipe line to be laid across his land.

ECONOMIC EFFICIENCY - The calculation of the relative economic value of alternative sets of conditions or outputs, and of alternative methods for achieving given sets of conditions or outputs. Economic effeciency is usually measured using present net value, benefit/cost ratio, or rate-of-return. Economic efficiency analysis includes evaluation of the relative merits of different outputs or conditions. In cost efficiency analysis, the conditions or outputs are set at a specified level and alternative means of achieving that specified level are evaluated.

ECONOMIC IMPACT, DIRECT - Impacts that derive directly from forest products or forest uses.

ECONOMIC IMPACT, INDIRECT - Impacts that arise from supporting industries selling goods or services to directly impacted industries.

ECONOMIC IMPACT, INDUCED - Impacts resulting from employees or owners of directly and indirectly impacted industries spending their income within the economy.

EDGE CONTRAST - A qualitative measure of the contrast of an edge, relative to the difference in structure of the vegetation of two adjacent areas. For example, "low", "medium", or "high" edge contrast.

EFFECT (IMPACT), ECONOMIC - The changes, positive or negative, in econoomic conditions, including the distribution and stability of employment and income in affected local, regional and national economies, which directly or indirectly result from an activity, project or program.

EFFECT (IMPACT), PHYSICAL AND BIOLOGICAL - The changes, positive or negative, in the physical or biological conditions which directly or indirectly results from an activity, project or program.

EFFECT (IMPACT), SOCIAL - The changes, positive or negative, in social and cultural conditions which directly or indirectly result from an activity, project or program.

EFFECTS - Results expected to be achieved, or actually achieved, relative to physical, biological and social (cultural and economic) factors resulting from an activity, project or program. Examples of effects are tons of sediment, pounds of forage, person-years of employment, income, etc. There are direct effects, indirect effects and cumulative effects.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range, other than members of the class Insecta, which have been determined by the Secretary to constitute a pest whose protection under the provisions of this Act (endangered Species Act of 1973) would present an overwhelming and overriding risk to man. The species must be designated in the Federal Register by the appropriate Secretary.

ENHANCEMENT - See VISUAL QUALITY OBJECTIVES

ENVIRONMENTAL ANALYSIS - An analysis of alternative actions and their predictable short- and long-term environmental effects, which include physical, biological, economic, social and environmental design factors and their`interaction (36 CFR 219.3(i) NFMA Regulations).

ENVIRONMENTAL ASSESSMENT - The concise public document required by the regulations for implementing the procedural requirements of NFMA 40 CFR 1508.9 (36 CFR 291.3(i) NFMA Regulations)

ENVIRONMENTAL IMPACT STATEMENT (EIS) - A document prepared by a federal agency in which anticipated environmental effects of a planned course of action or development are evaluated. A federal statute (Section 102 of the National Environmental Policy Act of 1969) requires that such statements be prepared. It is prepared first in draft or review form, and then in a final form. An impact statement includes the following points: (1) the environmental impact of the proposed action, (2) any adverse impacts which cannot be avoided by the action, (3) the alternative courses of actions, (4) the relationships between local short-term use of man's environment and the maintenance and enhancement of long-term productivity, and (5) a description of the irreversible and irretrievable commitment of resources which would occur if the action were accomplished.

E.O. (Executive Order) - Direction from the Executive Office of the President to one or more federal agencies.

EPHEMERAL CHANNEL - A channel which carries water briefly in response to storm events or runoff from snow melt.

EQUILIBRIUM - (As applied to a stream system) In the present context, this desribes a condition of balance between the stream's sediment load and its ability to transport the sediment. The stream has "adjusted" to any significant changes affecting its regime. Use of the term is not meant to imply a condition of stability in regard to local reaches of stream channel.

EROSION - (1) the wearing away of the land surface by running water, wind, ice or other geological agents, including such processes as gravitational creep; (2) detachment and movement of soil or rock by water, wind, ice or gravity.

Accelerated Erosion - Erosion much more rapid than normal, natural geological erosion, primarily as a result of the influence of the activites of man, or in some cases, of animals.

Geological Erosion - The normal or natural erosion caused by geological processes acting over long geologic periods.

ESCAPED FIRE - A fire which has exceeded, or is anticipated to exceed, initial action capabilities or the fire management direction or prescription. Fire resulting from a failed fire plan.

ESSENTIAL HABITAT - Areas designated by the Regional Forester possessing the same characteristics of critical habitat without having been so determined by the Secretary of the Interior or Commerce.

EVAPOTRANSPIRATION - The loss of water from land surfaces to the atmosphere by evaporation and by transpiration from plants.

EVEN-AGED MANAGEMENT - The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and therefore, tree sizes throughout the forest area). The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Shelterwood silviculture systems and clearcutting produce even-aged stands (36 CFR 219.3).

EVEN-AGED SILVICULTURE - The combination of actions that results in the creation of stands in which trees of essentially the same age grow together. managed even-aged forests are characterized by a distribution of stands of varying ages (and therefore tree sized) throughout the forest area. Regeneration in a particular stand is obtained during a short period at or near the time that the stand has reached the desired age or size and is harvested. Shelterwood systems and clearcutting and their many variations are the cutting methods used to harvest the existing stand and regenerate a new one. In even-aged stands, thinnings, weedings, cleanings and other cultural treatments between regeneration cuts are often beneficial. Cutting is normally regulated by scheduling the area of harvest cutting to provide for a forest that contains stands having a planned distribution of age classes (36 CFR 211.2(k) NFMA Regulations).

EXISTING VISUAL CONDITION (EVC) - The estimated condition presently occurring based on the degree of deviation from the natural condition.

EXTENSIVE GRAZING MANAGEMENT - No significant investments are made in range improvements and management systems are season-long grazing.

-F-

FAULT - A geologic term denoting a break in the subsurface strata. Usually the strata on one side of the fault line is displaced upward or downward relative to their original position.

FAVORABALE CONDITIONS OF FLOW - Initial legislation mandating uses of National Forest System lands (Organic Act of 1897) stated as a major purpose the provision of favorable conditions of flow. This has recently been interpreted by professionals in hydrology, and accepted through adjudication, as maintenance of flow regimen by providing sufficient quantities of water instream.

FISHERY LAKE - A lake containing or having the potential to support a fish population that provides recreational fishing opportunity.

FISHERY STREAM - A stream containing or having the potential to support a fish population that provides recreational fishing opportunity.

FIXED COST - These costs include general administration, functional program administration, protection, property boundary maintenance and dam maintenance.

FLOOD - An unusually high accumulation or runoff of surface waters.

FLOODPLAIN - That portion of a stream valley adjacent to the channel which is built of sediments during its present regime (i.e., the state of equilibrium between a stream and its ability to transport sediments) and which is covered with water when the stream overflows its banks at flood stages.

FLOODWAY - In the present context, that portion of a floodplain which is mostly devoid of rooted vegetation and is expected to be covered by an annual peak flow.

FLOW REGIME (Regimen) - Specifically, a term used to characterize the distribution of streamflow in a particular stream over time. In general, a term which encompasses many stream and channel characteristics such as stream order, flow velocity, flow volume, channel form, changes in channel form, capacity of stream to transport sediment, and supply of sediment. The term is also applied to a stream which has reached an equilibrium between aggradation and degradation (a graded stream).

FOREGROUND - Generally the area that lies within one-half mile of the viewer.

FOREST LAND - Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for nonforest use. Lands developed for nonforest use include areas for crops, improved pasture, residential or administrative areas, improved roads of any width, and adjoining road clearing and powerline clearing of any width (36 CFR 219.3).

FOREST PROGRAM - A forest program is the summary or aggregation of project or activity information that makes up an integrated (multifunctional) course of action for a given level of funding on a National forest that is consistent with the Forest Plan.

FORPLAN (Forest Planning Model) - A linear program used in the allocation and scheduling of management prescriptions to the National Forest System landbase.

FORPLAN PRESCRIPTION (FORPLAN RX) - A coordinated set of practices for a specific area of the Forest. The same as an ANALYSIS AREA PRESCRIPTION. Such a prescription includes the costs of each practice and estimates of outputs and effects which would result from application of the listed practices to a specific area.

FROST HEAVING - The pushing up of a surface by the accumulation of ice in the underlying soil. The freeze-thaw phenomenon refers to repeated episodes of frost heaving which result in continual movement of the soil surface.

FY - Fiscal Year for accounting purposes. USDA - Forest Service Fiscal Year is October 1 to September 30.

-G-

GOAL - A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed. (36 CFR 219.3)

GOODS AND SERVICES - The various outputs, including on-site uses, produced from forest and rangeland resources. (36 CFR 219.3)

GRIZZLY BEAR MANAGEMENT SITUATIONS - Management zones identified in "Guidelines for Grizzly Bear Management in Greater Yellowstone Area".

GROUNDWATER - Water within the earth that supplies wells and springs. Specifically, water in the zone of saturation where all openings in soils and rocks are filled - the upper surface of which forms the water table. (After Wester 1963).

GROUNDWATER RECHARGE AREA - See GROUNDWATER and RECHARGE

GROUP SELECTION -A modification of the selection system in which trees are removed periodically in small groups, resulting in openings that do not exceed two acres in size. This leads to the formation of a mosaic of age-class groups in the same area of a forest.

GROWING STOCK LEVEL -Growing stock levels are used to specify the stand density to be retained after a partial cut. Growing stock levels are designated by the square feet of basal area per acre desired when average stand diameter (DHBH) is ten inches or more. Basal area retained in a stand of smaller average diameter (DBH) is less than the designated level.

-H-

HABITAT CAPABILITY - The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife, fish or plant population. It is measured in terms of potential population numbers.

HABITAT CAPABILITY MODEL - A model which depicts the relationship of a species to a variety of habitat factors which provide for quantitative predictions of a species response (animal numbers) to habitat change.

HABITAT EFFECTIVENESS - The degree to which a physical wildlife habitat (food, water, shelter) is free from disturbances, and therefore attractive for wildlife occupancy.

HERD - That area containing all the year-long habitat needs of a population (herd) and within which 90 percent of the individuals within a population can be expected to be found throughout the year.

HORIZONTAL DIVERSITY - The vegetative diversity resulting from several stands of different plant communities or successional stages or both.

HUNTER SUCCESS - A measure usually expressed as the number of days hunted per animal taken, or as a percentage derived by comparing the number of animals taken to the number of hunters.

HYDROCARBONS - Organic compounds of hydrogen and carbon, whose densities, boiling points and freezing points increase as their molecular weights increase. Although composed only of carbon and hydrogen, hydrocarbons exist in a great variety of compounds, owing to the strong affinity of the carbon atom for other atoms and for itself. The smallest molecules are gaseous; the largest are solids. Petroleum is a mixture of many different hydrocarbons.

HYDROGRAPH - Distribution of flow in a stream through time.

HYSED - A computer model, developed in the Forest Service Rocky Mountain region, that simulates water and sediment yields, particularly in relation to timber harvest.

-I-

IMPLAN - A mathematical model designed to trace the flow of goods and services within an economy. An input/output model designed to examine effects of forest management on local and regional economies.

INDICATOR GROUPS - A group of wildlife species with similar needs, which when considered together, are presumed to indicate the effects of management activities on other species.

INDICATOR SPECIES - A wildlife species which is presumed to indicate the effects of management activities on other species with similar needs.

INDIRECT IMPACTS - Impacts or effects which are caused by the action and are later in tune if farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

INDUCED STRESS - Stress that is caused by man of his activities; stress would be expected to occur under natural or normal conditions.

INPUT - Land, labor or capital required for production processes.

INPUT/OUTPUT ANALYSIS - A technique for analyzing the interdependence of producing and consuming sectors in an economy.

INPUT/OUTPUT MODEL (I/O) - A mathematical or computerized model of a regional economy used for analyzing the interdependency of producing and consuming sectors in that economy and the impact of plan alternatives on local economies.

INTEGRATED PEST MANAGEMENT - A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated pest population on various resource values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pesthost system and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable. (36 CFR 219.3)

INTEGRATED RESOURCE MANAGEMENT - A management strategy which, among other things, emphasizes no resurce element to the exclusion or violation of the minimum legal standards of others. A management strategy which was developed considering the interrelationships of the different resource elements, i.e. management for one resource was not developed without consideration of other resource elements.

INTENSIVE GRAZING MANAGEMENT - Management designed to maintain or increase the carrying capacity on an allotment. There are significant investments in range improvements and/or complex grazing management systems are employed. A deferred rotation grazing system on sheep allotment with no range improvements is considered intensive grazing management.

INTERMITTENT STREAM - A stream or portion of a stream whose channel bed lies below the local water table for a portion of the year. As the water table falls during drier seasons, flows decline and eventually cease. The stream may flow most of the year, or for only a brief time. (See also PERENNIAL and EPHEMERAL).

INVENTORIED VISUAL QUALITY OBJECTIVE (IVQO) - The visual quality objective derived from application of the visual management system to current Forest conditions.

IRRETRIEVABLE - Applies to losses of production, harvest or use of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost while an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

IRREVERSIBLE - Applies primarily to the use of nonrenewable resources such as minerals or cultural resources, or to those factors which are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

ISOLATED OCCUPANCY TRACTS - Used in connection with oil and gas leasing procedures. Isolated occupancy tracts are those which are suitable for occupancy according to soil and watershed criteria, but which are considered to be inaccessible with ground based systems (using presently available technology). Road construction would impact soil and water resorces to an unaceptable degree. Restoration of roaded areas to or near the prior undisturbed condition is not considered possible.

IVQO - Inventory Visual Quality Objective

-K-

KEY AREA - A portion of range which, because of its location, grazing or browsing value, and/or use, serves as an indicative sample of range conditions, trend or degree of use seasonally. A key area guides the general management of the entire area of which it is a part.

KEY BIGHORN SHEEP AREAS - Those areas which are essential yearlong to some segment of a bighorn sheep herd.

KEY FORAGE SPECIES - Forage species whose use serves as an indicator to the degree of use of associated species and/or those species which must, because of their importance, be considered in the management program.

-L-

LANDFORM - (1) Term used to describe the many types of land surfaces which exist as a result of geological activity, such as a plateau, plan, basin, mountain, etc.; (2) A feature of the earth's surface with distinctive form characters which can be attributed to the dominance of particular processes of particular structures in the course of its development and to which the feature can be clearly related.

LAST TRIMESTER - That period eight to twelve weeks immediately prior to giving birth.

LIFESTYLE - a characteristically different way of living which may be an individual variant within the cultural main stream or may be an individual expression of a subculture. "Life sytles" are generally expressed through the means of economic sustenance, dwelling site and type, types of group association, and social practices such a family form, religious practices, sexual mores, style of dress, type of diet, etc.

LIMITING FACTOR - The mechanism(s) that determines the population level per unit area. Expressed in terms of habitat components and/or activites or physiological factors which limit population growth.

LINEAR PROGRAMMING - A mathematical method used to determine the most effective allocation of limited resources between competing demands when both the objective (e.g. profit or cost) and the restrictions on its attainment are expressible as a system of linear equalities or inequalities (e.g. $Y = a + bx$).

LISTED SPECIES - Any species of fish, wildlife or plant that is designated as endangered or threatened under the Endangered Species Act. These species are considered officially listed when so designatd in the Federal Register.

LOCAL DEPENDENT INDUSTRIES - Industries relying on National Forest outputs for economic activity.

LOCAL ROADS - Roads connecting terminal facilities with Forest collector or Forest arterial roads or public highways. These roads normally serve a specific resource or activity.

LONG-TERM SUSTAINED YIELD TIMBER CAPACITY - The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified intensity consistent with multiple-use objectives.

LONG TERM EFFECTS - A relative indicator as to the duration of an impact or change; the effects last longer than the period of time which is considered reasonable for recovery. An effect is long term when it persists through or beyond natural lifetime of an individual.

-M-

M - Thousand.

MANAGEMENT AREA - An area with similar management objectives and a common set of standards and guidelines.

MANAGEMENT AREA DIRECTION - A statement of general management intent for a Management Area including a set of standards, guidelines, and mitigation measures governing practices carried out on the area.

MANAGEMENT CONCERN - An issue, problem or a condition which constrains the range of management practices identified by the Forest Service in the planning process. (36 CFR 219.3)

MANAGEMENT DIRECTION - A statement of multiple-use and other goals and objectives, the associated management prescriptions, and standards and guidlines for attaining them. (36 CFR 219.3)

MANAGEMENT INDICATOR SPECIES - Those species selected in the planning process to monitor the effects of planned management activities on viable populations of all wildlife and fish species, including Threatened and Endangered Species and those species that are socially or economically important.

MANAGEMENT INTENSITY - A managment practice or combination of management practices and associated costs designed to obtain different levels of goods and services. (36 CFR 219.3)

MANAGEMENT PRACTICE - A specific activity, measure, course of action or treatment. (36 CFR 219.3)

MANAGEMENT PRESCRIPTION - Management practices and intensity selected and scheduled for application on a specific area to attain multiple use and other goals and objectives. (36 CFR 219.3)

MASS MOVEMENT - Down-slope unit movement of a portion of the land's surface, i.e. a single landslide or the gradual, simultaneous downhill movement of the whole mass of loose earth material on a slope face.

MAXIMUM BIOLOGICAL GROWTH POTENTIAL - The potential yield from timber stands that are in a managed condition throughout their lives. Management intensity can include full stocking control, genetically improved planting stock and fertilization.

MAXIMUM MODIFICATION - See VISUAL QUALITY OBJECTIVES.

MBF - Million Board Feet

MCF - One thousand cubic feet.

MIDDLEGROUND - The area between the foreground and background in a landscape. The area located from one-half mile to five miles from the viewer.

MIGRATION - The seasonal movement of wildlife from one range to another.

MIGRATION CORRIDORS - Those travel corridors (restricted travelway) used traditionally by large numbers of wildlife in their seasonal movement from one range to another. Such corridors are mapable (as they are very restricted and usually funnel through narrow saddles and canyons). Travel corridors indicate the specific movement corridor between seasonal ranges.

MIGRATION ROUTES - Those travel routes used traditionally by wildlife in their seasonal movement from one range to another. Travel routes indicate the general movement pattern between seasonal ranges.

MINERAL ENTRY - The filing of a mining claim on public land to obtain the right to any minerals it may contain.

MINERAL ENTRY WITHDRAWAL - The exclusion of locatable mineral deposits from mineral entry on areas required for administrative sites by the Forest Servie and other areas highly valued by the public. Public lands withdrawn from entry under the General Mining Laws and/or the Mineral Leasing Laws.

MINERALS, COMMON VARIETY - Deposits, which although they they may have value for use in trade or manufacture, do not possess a distinct, special economic value. These minerals include sand, stone, gravel, pumicite, cinders and pumice.

MINERALS, LEASABLE - Coal, oil, gas, phosphate, sodium, potassium, oil shale and geothermal steam.

MINERALS, LOCATABLE - Those hard rock minerals which are mined and processed. May include certain nonmetallic minerals and uncommon varieties of mineral materials such as valuable and distinctive deposits of limestone or silica. May include any solid, natural, or inorganic substance occurring in the crust of the earth, except for the common varieties of mineral materials and leasable minerals.

MINIMUM INSTREAM FLOW - Those quantities of flow judged sufficient to maintain favorable conditions in the channel or stable hydrologic regime (as provided in this case by the Big Horn Adjudications). Also referred to as those streamflows necessary to maintain ecosystem values, fish habitat, aesthetics, wildlife or livestock use, recreation, navigation or other uses dependent upon instream flows.

MISSION - A major, continuing national area of concern or responsibility of the Forest Service that is directed by legislation, order or regulation. The Forest Service mission represents the basic reason for the existence of the Forest Service as a Federal agency and characterizes the agency's role in solving broad, national problems.

MITIGATE - To offset or lessen real or potential impacts of effects through the application of additional controls or actions. Counter measures employed to reduce or eliminate undesirable or unwanted results.

MIXING ZONE - A region in which an effluent (pollutant) is in transit from the outfall source of the receiving waters. The effluent is progressively diluted but its concentration is higher than in the receiving waters.

MM - Million.

MMBF - Million Board Feet

MODIFICATION - See VISUAL QUALITY OBJECTIVES

MONITORING AND EVALUATION - The evaluation on a sample basis of Forest Plan management practices to determine how well objectives have been met, as well as the effects of those management practices on the land and environment.

MORTALITY - The frequency of death in a given population.

MRVD - Thousand Recreation Visitor Days.

MULTIPLE-USE - The management of all the various renewable surface resources of the National Forest system so that they are utilized in the combination that will best meet the needs of the American People: making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in the use to conform to changing needs and conditions: that some lands will be used for less than all of the resources; and harmonious and coodinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output. (36 CFR 219.3)

MUNICIPAL WATER SUPPLY (Public Water Supply) - Any water supply being distributed by ten or more service connections utilized to furnish water for human consumption eitner in preparing foods or beverages for inhabitants of residences or business establishments (Wyoming Environmental Quality Act).

-N-

NATALITY - The proportion of the number of births in a given area in comparison to the total population.

NATIONAL DIRECTION - Statements of missions, goals, and objectives that guide Forest Service planning.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) - An act, to declare a National Policy which will encourage productive and enjoyable harmony betwen man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the nation; and to establish a Council on Environmental Quality.

NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN - A plan developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976, that guides all natural resource management activites and establishes management standards and guidelines for the National Forest System lands of a given National Forest.

NATIONAL FOREST MANAGEMENT ACT (NFMA) - A law passed in 1976 amending the Forest and Rangeland Renewable Resources Planning Act that includes as a requirement the preparation of Regional and Forest Plans and the preparation of regulations to guide that development.

NATIONAL FOREST SYSTEMS - All National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation or other means, the National Grasslands and land utilization projects administered under Tital III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system. (16 U.S.C. 1608)

NATIONAL RECREATION TRAIL - A trail that has been designated as a part of the National Trails System as provided in Section 4(a) of the NTS Act. These trails provide a day-use or extended trail experience for a variety of outdoor recreation opportunities, reasonably accessible to local population centers. NTR's may be either motorized or nonmotorized.

NATIONAL WILD AND SCENIC RIVER SYSTEM - A system of selected rivers as provided in the Wild and Scenic Rivers Act of October 2, 1968, as amended, that are authorized by the Act of Congress or Act of the State Legislature and designated as a Wild, Scenic or Recreational River, which is a free flowing stream, free of impoundments with varying degrees of accessibility and the shoreline development with outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values, to be preserved for the benfit of present and future generations.

NATURAL EROSION RATE - The rate at which the earth's surface is worn away by natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by man.

NATURAL FOREST - The condition of a forest environment at any point in time, including its associated plant and animal communities, which has been reached essentially through the process of natural succession. This process would include the effects of natural catastrophic occurrences.

NEONATAL PERIOD - The period after giving birth (first month) and when the offspring is not able to (or does not usually) accompany the female.

NEPA - National Environmental Policy Act.

NET PUBLIC BENEFITS - An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principles of multiple-use and sustained-yield. (36 CFR 219.3)

NFMA - National Forest Management Act.

NONCOMMERCIAL SPECIES - Tree species of small size, poor form or inferior quality which normally do not develop into trees suitable for industrial wood products.

NONDECLINING YIELD - A level of timber production planned so that the planned sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade.

NONFOREST - See TIMBER SUITABILITY CLASSIFICATION

NONPOINT SOURCE POLLUTION (Non-Point Pollution Source) - Pollution whose source is general rather than specific in location. It is widely used in reference to agricultural and related pollutants. For example, production of sediment from road systems where no point source can be identified. See also POINT SOURCE POLLUTION, BEST MANAGEMENT PRACTICE and WATER QUALITY STANDARDS.

NONRESERVED - Acres outside of designated wilderness, primitive areas or areas withdrawn from mineral entry.

-O-

OBERS - Office of the Bureau of Economic Research and Statistics.

OBJECTIVE - A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals. (36 CFR 219.3).
OBJECTIVE FUNCTION - A mathematical expression of the selection criterion used in linear programming problems.

OCCUPIED GRIZZLY BEAR HABITAT - The area delineted in 1979 that contains grizzly bear territory as determined by 1969-1979 sightings, signs and hills. It is made up of grizzly bear management situations I, II and III as defined in the grizzly bear "Guidelines".

OFF-ROAD VEHICLE (ORV) - Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, snow, ice, marsh, swampland or other natural terrain. In includes, but is not limited to, four-wheel drive or low pressure tire vehicles, motorcycles and related two-wheel vehicles, amphibious machines, ground effect or air-cushion vehicles.

OFF-ROAD VEHICLE (ORV) USE - Off-road vehicle use as discussed in the Shoshone National Forest Draft EIS and Proposed Plan means use activities involving the vehicles described above (with the exception of snowmobiles operating on snow). Such vehicle use is restricted to designated open roads and trails. Cross-country travel without benefit of roads, primitive roads or trails is not allowed on the Shoshone National Forest.

OFF-SITE IMPACTS - Secondary impacts; those impacts which occur as a result of an operation or event physically located elsewhere. Specifically, those impacts which occur downstream from an area in which oil and gas operations are underway.

OIL AND GAS POTENTIAL - Defined in terms of varying degrees for the probablility of the occurrence of oil and gas accumulations.

High Potential - Geologic environment is highly favorable for occurrence and is adjacent to established areas of production.

Moderate Potential- Favorable for discovery of oil and gas fields based only on surveyed geologic structures.

Low Potential: - Known or interpreted to have thin prospective sedimentary rocks that may contain accumulations of oil or gas.

OPPORTUNITY - A proposal that is considered in developing alternative activities, projects or programs where an option exists to invest profitably to improve or maintain a present condition.

OPPORTUNITY COST - The value of the benefits foregone or given up due to the effect of choosing another management alternative that either impacts existing outputs or shifts resources away from other activities so that they are no longer undertaken and their benefits are lost.

OUTPUT - A good, service or on-site use that is produced from forest and rangeland resources. See FSH 1309.11 for forest and rangeland outputs, codes and unit measure.

OUTPUT, INDUCED - A good, service or on-site use which is incidental to the objectives of the resource element. An example may be improved wildlife habitat acres as an induced output of the timber harvest administration activity which produces a primary output of board feet of timber.

OUTPUT, MARKET - A good, service or on-site use that can be purchased at a price.

OUTPUT, NONMARKET - A good, service or on-site use not normally exchanged in a market.

OUTPUT, PRIMARY - A good, service or on-site use that results from the completion of an activity, project or program that meets the specific objective of the resource. Examples are board feet of timber, recreation visitor days, etc.

-P-

PAOT - Persons-at-one-time. Used to define recreation capacity.

PAOT DAYS - Persons-at-one-time calculated over a recreation season. Used to define recreation capacity for a season.

PARTIAL RETENTION - See VISUAL QUALITY OBJECTIVE

PATENTED MINING CLAIM - A patent is a document which conveys a title. When patented, a mining claim becomes private property and is land over which the United States has no property rights, except as may be reserved in the patent. After a mining claim is patented, the owner does not have to comply with requirements of the General Federal Mining Law, but is required to meet State regulations.

PEAK FLOW - The greatest quantity of flow or discharge carried by a stream during a given period to time (e.g. annual peak).

PERENNIAL STREAM - Streams that flow throughout the year and from source to mouth. The channel bed lies below the local water table throughout the average water year.

PLANNING AREA - The area of the National Forest System covered by a Regional guide or forest plan. (36 CFR 219.3)

PLANNING HORIZON - The overal time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions. (36 CFR 219.3)

PLANNING PERIOD - A planning period is one decade. It is the time interval within the planning horizon that is used to show incremental changes in yields, costs, effects and benefits (36. CFR 219.3). Planning period 1 is from 1980 (1985) through 1990; planning period 2 is from 1991 through 2000, planning period 3 is from 2001 through 2010, planning period 4 is from 2011 through 2020, and planning period 5 is from 2021 through 2030.

POACH - To take fish or game illegally.

POINT SOURCE POLLUTION - Pollution whose source is specific rather than general in location. For example, particulate matter emanating from a specific smoke stack, or sediment entering a stream from a specific bridge construction site.

POLICY - A guiding principle upon which is based a specific decision or set of decisions.

POLICY ISSUE - An action or set of circumstances that has bearing on current of future policy.

PRECOMMERCIAL THINNING - The selective felling or removal of trees in a young stand primarily to accelerate diameter increment on the remaining stems, maintain a specific stocking or stand density range, and improve the vigor and quality of the trees that remain.

PREDICTED VISUAL QUALITY CONDITION - The estimated level or condition predicted to occur on-the-ground, in the future, if a specified managment practice continues or is implemented.

PRENATAL PERIOD - The period immediately prior to giving birth (several weeks) and is part of the last trimester period.

PRESCRIBED FIRE - A wildland fire burning under specified conditions which will accomplish certain planned objectives. The fire may result from either planned or unplanned ignitions. Plans for use of unplanned ignitions for this purpose must be approved by the Regional Forester.

PRESENT NET BENEFIT (PNB) - Present (current) value of all benefits discounted to the present.

PRESENT NET VALUE (PNV) - The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area. (36 CFR 219.3)

PRESENT VALUE COST (PVC) - Present (current) value of all costs discounted to the present.

PRESERVATION - See VISUAL QUALITY OBJECTIVES

PRICE-QUANTITY RELATIONSHIP - A schedule of prices that would prevail in a market for various quantities of the output exchanged. See DEMAND SCHEDULE and SUPPLY SCHEDULE

PRIMARY BIRTHING AREA - The geographical area that is considered essential for maintaining the reproductive segment of a herd during the birthing area.

PRIMITIVE RECREATION OPPORTUNITY - See RECREATION OPPORTUNITY SPECTRUM

PRISTINE - A term used for the prediction of recreation opportunities where human activities maintain the environment's natural ecological processes. Motorized use is far removed from the area.

PROGRAM - Sets of activities or projects with specific objectives, defined in terms of specific results and responsibilities for accomplishments.

PROGRAM BUDGET - A plan that allocates annual funds, work force ceilings and targets among agency management units.

PROGRAM BUDGET LEVEL - A single, comprehensive integrated program responsive to the Chief's direction that specifies a level of production attainable from a given investment of dollars and other resources. Each budget level represents a complete, full and independent package within the criteria and constraints identified.

PROGRAM ELEMENT - An individual Forest Service area of responsibility, which in combination with other elements, comprises the statutory or Executive directed mission of the Forest Service. Specific Forest Service program elements are defined in the Management Information Handbook. (FSH 1309.11)

PROGRAM PROPOSALS - A multiyear course of action proposed under a given set of assumptions and constraints.

PROGRAMMED VISUAL QUALITY OBJECTIVE - The visual quality level or condition to be achieved at stated intervals over the life of the approved plan. Used for plan monitoring.

PROJECT - An organized effort to achieve an objective identified by location, activities, outputs, effects, and time period and responsibilities for execution.

PROJECT DESIGN - The process of developing specific information necessary to describe the location, timing, activities, outputs, effects, accountability and control of a project.

PROPER USE - A degree and time of use of current year's growth which, if continued, will either maintain or improve the range condition consistent with conservation of other natural resources.

PUBLIC INVOLVEMENT - A Forest Service process designed to broaden the information base upon which agency decisions are made by (1) informing the public about Forest Service activities, plans and decisions, and (2) encouraging public understanding about and participation in the planning processes which lead to final decision making.

PUBLIC ISSUE - A subject or question of widespread public interest relating to Management of the National Forest System. (36 CFR 219.3)

PUBLIC PARTICIPATION ACTIVITIES - Meetings, conferences, seminars, workshops, tours, written comments, survey questionnaires and similar activities designed or held to obtain comments from the general public and specific publics.

-R-

RARE II - Second Roadless Area Review and Evaluation.

RANGE ALLOTMENT - A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under an allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System lands administered by the Forest Service.

1982 REAL DOLLARS - The value in purchasing power of the dollar in 1982. The effects of changes in purchasing power (inflation) since 1982 have been removed.

REAL DOLLAR VALUE - A monetary value which compensates for the effects of inflation. (36 CFR 219.3)

RECEIPT SHARES - The portion of receipts derived from Forest Service resource management that is distributed to State and country governments such as the Forest Service 25 percent fund payments. (36 CFR 219.3)

RECHARGE - The addition of water to an aquifer that occurs naturally from infiltration of rainfall and from water flowing over earth materials that allow water to infiltrate below the land surface.

RECREATION OPPORTUNITY SPECTRUM (ROS) - Recreation resource delineations which identify a variety of recreation experience opportunities in six classes along a continuum from primitive to urban. Each class is defined in terms of natural resource settings, activities which occur within it, and the experience opportunities available. The six classes are:

> Primitive (P). Essentially unmodified natural environment where evidence of other users is low, usually three miles or more from roads. Visitors enjoy hiking, horseback riding, nature sutdy and other nonmotorized uses. Visitors experience isolation, independence, closeness to nature and self-reliance in an environment offering a high degree of challenge and risk.
>
> Semiprimitive Nonmotorized (SPNM). The area is predominantly a natural environment with evidences of other users and generally over one-forth mile from roads. Visitors enjoy nonmotorized uses and experience a high probability of isoloation, independence and closeness to nature. Challenge and risk are generally high. Resource management activities may be present, however, natural appearance is still maintained.

Semiprimitive Motorized (SPM). Setting, activities and opportunities are generally the same as 2 above, except that the primitive roads may be present and motorized use is permitted. Setting, activities and opportunities are affected accordingly though there is still a moderate probability of experiencing isolation from sights and sounds of humans.

Roaded Natural (RN). The area has predominately a natural appearing environment with moderate evidence of sights and sounds of humans. Concentration of users is moderate to low. Roads of better than primitive class are usually within one-half mile. A broad range of motorized and nonmotorized activity opportunities are available. Management activities including timber harvest are present but harmonize with the natural environment.

Rural (R). These areas are substantially modified. Sights and sounds of others are readily evident. Interactions between users is moderate to high. Numerous facilities are usually present. Motorized use and facilities are common. Resource management activities may be common and obvious.

Urban (U). These areas are located in or immediately adjacent to cities and towns. The environment is usually highly modified and contains numerous improvements. Large concentrations of humans can be expected.

RECREATION TRAVELWAY - The area adjacent to selected or proposed highways, roads and trails, subject to special management measures to maintain or improve the aesthetic quality for the traveler.

RECREATION VISITOR DAY (RVD) - A unit for measuring recreation activites which aggregates 12 visitor hours. This may consist of one person for 12 hours, 12 persons for one hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups.

REFORESTATION - The restocking of an area with forest trees, whether by artificial seeding, planting, or the use of measure to obtain natural seedfall and seedling establishment.

REGION - An area covered by a Regional guide. See FSM 1221.3 for organizatinal definitions.

REGULATED FOREST LAND - See TIMBER SUITABILITY CLASSIFICATION

REHABILITION - See VISUAL QUALITY OBJECTIVES

RENEWABLE RESOURCES ASSESSMENT - An appraisal of the Nations' renewable resources that recognizes their vital importance and the necessity for long-term planning and associated program development. The Assessment meets the requirements of Section 3 of the Resources Planning Act and includes analyses of present and anticipated uses, demands and supplies of the renewable resources: a description of Forest Service programs and responsibilities; and a discussion of policy considerations, laws and regulations.

RENEWABLE RESOURCES PROGRAM - The program for management and administration of the National Forest System, for Research, for Cooperative State and Private Forest Service programs, and for conduct of other Forest Service activities developed in accordance with the Forest and Rangeland Renewable Resources Planning Act.

RESPONSIBLE LINE OFFICER - For land management planning purposes, the Forest Service employee who has been delegated the authority to carry out a specific planning action. (35 CFR 219.3)

REST ROTATION GRAZING - A systematic rotation of different amoung grazing units with a provision where one or more units are not grazed in a given grazing season.

RETENTION - See VISUAL QUALITY OBJECTIVES

RIGHTS-OF-WAY (ROW) - The privilege which one person or persons particularly described, may have of passing over the land of another in some particular line. Usually, an easement over the land of another. The term is used to describe a strip of land used for railroad and highway purposes for pipe or pole lines and for private or public passageways.

RIM - Recreation Information Management

RIPARIAN AREAS - Lands adjacent to streams, lakes and other bodies of water and which are characterized by vegetation requiring free or unbound water.

RIPARIAN-AQUATIC ECOSYSTEM - Combines the ecosystems associated with stream channels, lake beds, surface water itself and the adjacent land area that is characterized by vegetation requiring free or unbound water. "Riparian area" is a cover term which is meant to encompass the riparian-aquatic ecosystem including floodplains and wetlands. Dependent resources are those which owe their existence to riparian areas. Riparian zones are delineated as the land and vegetation extending at least 100 feet horizontally from the edges of all lakes and perennial streams.

RIPARIAN AREA DEPENDENT RESOURCES - . Examples are: water and its prevalent quality, fisheries, wildlife and vegetation. These resources are to be protected in the event of a conflict with other uses - FSM 2500. See RIPARIAN AQUATIC ECOSYSTEM

RIPARIAN ZONE - Delineation is directed by FSM 2500. See RIPARIAN-AQUATIC ECOSYSTEM

ROAD MAINTENANCE LEVELS - Based on traffic management and use objectives, each road or road segment is assigned one of the following maintenance levels.

Level 1. This level is basic custodial care as required to protect the road investment, and to see that damages to adjacent land and resources is held to a minimum.

Level 2. Level 2 requires the basic care of level 1 plus logging out, brushing out, and restoring road prism as necessary to provide passage.

Level 3. Level 3 roads are to be maintained for safe and moderate convenient travel suitable for passenger cars.

Level 4. At this level, more consideration is given to the confort of the user. These roads are frequently surfaced with aggregate material, but some routes may be paved.

ROADED NATURAL RECREATION - See RECREATION OPPORTUNITY SPECTRUM

ROS - Recreation Opportunity Spectrum

ROTATION - The period of years between the initial establishment of a stand of trees and the time when it is considered ready for cutting and regeneration.

ROUNDWOOD PRODUCTS - Logs, bolts or other round sections cut from trees for industrial or consumer uses. (Pulpwood, fuelwood, piling, poles, posts, hewn ties, mine timbers and various other round, split or hewn products).

RPA - The Forest and Rangeland Renewable Resources Planning Act of 1974.

RUNOFF - That portion of the precipitation on an area which is discharged from the area through stream channels. That which is lost without entering the soil is called surface runoff and that which enters the soil before reaching the stream is called ground water runoff or seepage flow from ground water.

RURAL - See RECREATION OPPORTUNITY SPECTRUM

-S-

SALE SCHEDULE - The quantity of timber planned for sale by time period, from the area of suitable land covered by a Forest plan. The first period, usually a decade, of the selected sale schedule provides the allowable sale quantity. Future periods are shown to establish that long-term sustained yield will be achieved and maintained. (36 CFR 219.3)

SANITATION CUTTING (Salvage) - Sanitation cutting is the removal of dead, dying, deteriorating or susceptible trees to prevent the spread of pests or pathogens. This promotes forest hygiene and recovers trees damaged by fire, wind, insects, fungi or other injurious agent before the timber becomes commercially valueless.

SATISFACTORY RANGE CONDITION - Range condition refers to both the vegetation and soil resource. A summary rating for the two is reflected by whichever resource rating is lower. Volume of forage produced, plant density, plant composition and plant vigor are all factors affecting range conditon. Usually if productivity is high, plant density, composition and vigor are within desirable limits. Productivity is one variable that is rather easy to relate to (realize there are others). Where satisfactory range condition is being maintained, the current productivity (number/acre) is within acceptable limits relative to what that range is naturally capable of producing. The capability varies with the natural factors endemic to the site.

SAWTIMBER - Trees suitable in size and quality for producing logs that can be processed into lumber. For planning purposes, trees with a seven-inch diameter or larger are classified as sawtimber.

SEASON LONG GRAZING - Livestock are allowed access to any part of the suitable range of the allotment throughout the grazing season. This term is synonymous with continuous grazing.

SECURITY COVER - Vegetative or geological features used by wildlife as a means of providing a feeling of well-being of escape from stress.

SEISMIC - Pertaining to earth vibration.

SELECTION CUT - Selection cutting is the periodic removal of trees invididually or in small groups from an uneven-aged forest. By this method, both regeneration cutting and tending of immature stand components are accomplished at each entry.

SEMIPRIMITIVE MOTORIZED RECREATION - See RECREATION OPPORTUNITY SPECTRUM

SEMIPRIMITIVE NONMOTORIZED RECREATION - See RECRETION OPPORTUNITY SPECTRUM

SENSITIVITY ANALYSIS - A determination of the consequences of varying the level of one or several factors while holding other factors constant.

SHELTERWOOD - An even-aged silviculture system in which a new stand is established under the protection of a partial canopy of trees. The old stand is removed in a series of two or three harvest cuts, the last of which removes the shelterwood when the new even-aged stand is well established.

SHORT TERM EFFECTS - A relative indicator as to the duration of an impact or change; the effect is repairable within a reasonable period of time following the action. See LONG TERM EFFECTS.

SHOSHONE MANAGEMENT PRESCRIPTION - A statement of general management intent for a Management Area on the Shoshone National Forest including a set of standards, guidelines, and mitigation measures governing practices carried out on such areas.

SILVICULTURAL SYSTEM - A management process whereby forests are tended, harvested and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop and provide for regeneration and according to the type of forest thereby produced. (36 CFR 219.3)

SILVICULTURE - The science and art of cultivating (i.e. growing and tending) forest stands.

SITE INDEX - A measure of site quality based on the height of dominant trees in a stand at an arbitrary base age (usually 100 years).

SITE QUALITY - The capability of a land area to grow trees or other vegetation at a rate which is relatively uniform and predicatable. Site quality is estimated using a measure called site index.

SKIERS-AT-ONE-TIME (SAOT) - The number of skiers using a developed ski area in a single day.

SLASH - The wood residue left on-the-ground after harvesting, cultural operations, windstorms, fire or road building. It includes unutilized logs, uprooted stumps, broken or uprooted stems, tops, branches, leaves, etc.

SOIL - (1) The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants; (2) the unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of parent material, climate (including moisture and temperature effects), macro- and micro-organisms and topography, all acting over a period of time and producing a product - soil - that differs from the material from which it is derived in many physical, chemical, biological and morphological properties and characteristics.

SOIL IMPROVEMENT - The processes for, or the results or, making the soil more productive for growing plants (includes controlling soil erosion).

SOIL PRODUCTIVITY - The ability of a soil to maintain a structural, chemical and biologic integrity sufficient to support optimal vegetative growth.

SOIL SURVEY - The systematic examination, description, classification and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of field examinations.

SOLIFLUCTION - The slow downslope movement of soil resulting from alternating periods of freeze and thaw or a continually saturated soil condition.

SPECIAL USE PERMITS - Permits authorizing the occupancy and use of land.

STREAM ORDER - A term used to depict the size of a stream. Using a channel network map, including all intermittent and permanent flow lines located in clearly defined valleys, the smallest fingertip tributaries are designated "order 1". Where two first order channels join, a channel segment of "order 2" is formed; where two or more "order 2" join, a segment of "order 3" is formed, and so forth.

STRESS - Physical, mental or emotional strain or tension that distrubs or interferes with the normal physilogical equilbrium of an organism.

SUBSURFACE RECHARGE - That portion of precipitation which percolates through the soil matrix and mantle to replenish subsurface water bearing structures.

SUITABLE FOREST LAND - See TIMBER SUITABILITY CLASSIFICATION

SUITABILITY - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

SUPPLY - The amount of an output that producers are willing to provide at the specified price, time period and condition of sale.

SUPPLY SCHEDULE (Curve) - A schedule of amounts of an output that producers are willing to provide at a range of prices, at a given point in time and condition of sale. See PRICE-QUANTITY RELATIONSHIP

SUPPRESSION - Management action applied to wildfire, including controlling, containing, and confining.

SURFACE RECHARGE - That portion of precipitation which percolates into relatively shallow water tables (as in riparian wetlands) and provides for maintenance of surface flow in adjacent stream channels. Hillslope water maintains or replenishes streamflows by hydraulic pressures exerted through the soil matrix. See PERENNIAL STREAM

SUSTAINED YIELD - The acheivement and maintenance in perpetuity of a high level annual or regular periodic output of the various renewable resources of the National Forest without impariment of the productivity of the land. (36 CFR 219.2(hh))

SUSTAINED-YIELD OF PRODUCTS AND SERVICES - The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land. (36 CFR 219.3)

-T-

T & E - Abbreviation for Threatened and Endangered Species.

TENTATIVELY SUITABLE FOREST LAND - See TIMBER SUITABLITY CLASSIFICATION

THINNING - Cutting made in an immature stand to accelerate the diamter increment (annual growth) and improve the average form of the remaining trees.
THIRD TRIMESTER - The 8 to 12 week period immediately prior to giving birth.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species.

TIMBER PRODUCTION - The purposeful growing, tending, harvesting and regeneration of regulated crops of trees to be cut into logs, bolts or other round sections for industrial or consumer use. For planning purposes, the term "timber production" does not include production of fuelwood. (36 CFR 219.3)

TIMBER SUITABILITY CLASSIFICATION - National Forest System land is evaluated under each of the land management alternatives to determine its suitability for timber management. The following descriptions pertain to each of the suitability classifications:

Nonforest Land. Land which has never supported forests and lands formerly forested where timber management is precluded by development for other uses (administrative sites, roads and pipeline or powerline corridors, for example.)

Forest Land. Lands capable of supporting trees whose canopies can cover 16 percent or more of the land surface, or lands formerly having had such tree cover and not currently developed for nonforest use.

Available Forest Land. Productive forest land that is not reserved or deferred from timber management (also referred to as commercial forest land).

Unavailable Forest Land. Lands classed as either productive reserved or productive deferred. Unavailable lands have been legislatively or administratively withdrawn from timber production (wilderness, wilderness study areas).

Tentatively Suitable Forest Land. Available forest lands which can be harvested without significant degradation of inherent productivity and on-site resources (wildlife habitat, water quality and soil stability, for example.

Suitable Forest Land. Suitable forest lands which will receive scheduled silvicultural treatments during the plan period.

Nonsuited Forest Land. Available forest lands where silvicultural treatment is not a goal of management and harvest volumes (if any) are unscheduled (administrtive and developed recreation sites, for example).

TRAILHEAD - Developed recreation sites with parking, signing and other facilities designated to provide a take-off point for trail users at major access points and termini of a trail.

TRANSITION WILDERNESS - Same as Recreation Opportunity Spectrum class Semiprimitive Nonmotorized (Wilderness).

TRANSITORY RANGE - Relatively short-term grazing areas produced by timber harvest or other activity that temporarily inreases forage production.

TURBIDITY - An optical property of sediment suspended in water. Turbidity is measured according to the propensity of sediment to scatter light that is projected through a sample. Very turbid water may be aesthetically displeasing, a barrier to fish, hinder fishing recreation, and is unsuitable for consumption. Sediment, as indicated by turbidity measurement can have pervasive effects throughout an aquatic ecosystem.

TWO-STEP SHELTERWOOD - An even-aged silviculture system in which the old stand is removed in two or more successive cuttings.

-U-

UNAVAILABLE FOREST LAND - Those portions of the Forest administratively and legislatively excluded from use for timber harvest or livestock grazing. See TIMBER SUITABILITY CLASSIFICATION

UNACCEPTABLE MODIFICATION - See VISUAL QUALITY OBJECTIVES

UNCONTROLLABLE OUTPUTS - Outputs from National Forest System lands that are naturally occurring or that occur without any action by management. Examples are water yield and dispersed recreation activities such as hunting and fishing.

UNEVEN-AGED MANAGEMENT - The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age-classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

UNEVEN-AGED SILVICULTURE - The combination of actions that result in the creation of forests in which trees of several or many ages may grow together. Managed uneven-aged forests may take several forms depending upon the particular cutting methods used. In some cases, the forest is essentially similar throughout with individual trees of many ages and sizes growing in close association. In other cases, small groups of trees of similar age may be intermingled with similar groups of different ages; although the groups are even-aged, they are not recorded separately. Finally, an uneven-aged forest may contain two or three distinct age classes on the same area, creating a storied forest. Under uneven-aged silviculture, regeneration is obtianed several or many times during the period required to grow an individual tree to maturity. Single-tree selection cutting, group selection cutting and other forms of partial cutting are used to harvest trees, obtain regeneration and provide appropriate intermediate culture.

UNREGULATED FOREST LAND - See TIMBER SUITABILTIY CLASSIFICATION

UNSUITABLE FOREST LAND - See TIMBER SUITABILITY CLASSIFICATION

URBAN AREAS - See RECREATION OPPORTUNITY SPECTRUM

USC - United States Code.

-V-

VALLEY INNER GORGE - A landform consiting of incised (deeply cut) valleys with slopes standing at or near the effective angle of repose. Inner gorges are prone to failure under extreme, naturally-occurring events and under the influence of man's activities. Failure of inner gorge side slopes contributes soil, rock and organic debris directly into stream channels, thus causing a self-sustaining cycle of on- and off-site effects. The margin of a valley inner gorge can usually be identified as the first sharp break in slopes above a stream channel.

VERIFIED WOLF SIGHTING - The sighting of a wolf which is confirmed by a qualified Forest Service, Wyoming Game and Fish Department or Fish and Wildlife Service wildlife biologist.

VIABLE POPULATION - A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area.

VISUAL ABSORPTION CAPABILITY (VAC) - The ability of the landscape to absorb management activities without alternation of the characteristic landscape. Rated as high, moderate and low.

VISUAL RESOURCE - The composite of basic terrain, geologic features, water features, vegetative patterns and land use effects that typify a land unit and influence the visual appeal of the unit. For planning and management purposes the visual resource is classified into characteristic landscapes and visual variety classes.

Characteristic Landscape - Ecological land units that have common distinguishing visualk characteristics of landform, vegetation patterns and soils and waterform characteristics. These landscape character types serve as a frame of reference in classifying the physical features of an area into variety classes.

Visual Variety Classes - There are three variety classes which identify the degree of visual variety in the natural characteristic landscape:

Class A - Distinctive -

Refers to those areas where features of landform, vegetation and waterform are of unusual or outstanding visual quality. They are usually not common in the character subtype.

Class B - Common -

Refers to those areas where features contain variety in form, line, color and texture or combinations thereof, but which tend to be common throughout the subtype and are not outstanding in visual quality.

Class C - Minimal

Refers to those areas whose features have little change in form, line, color or texture. Includes all areas not found in Classes A and B.

VISUAL QUALITY OBJECTIVES (VQO) - Goals that describe acceptable degrees of visual alternation allowed in the natural landscape.

Preservation (P). Allows natural ecological changes only. Management activities, except for very low visual impact recration facilities are prohibited.

Retention (R). Provides for management activities which are not visually evident. Activities may only repeat form, line, color and texture which are frequently found in the surrounding characteristic landscape.

Partial Retention (PR). Provides for management activities which remain visually subordinate to the characteristic landscape. Activities may repeat form, line, color and texture common to the characteristic landscape. Activities may also introduce form, line, color or texture which are not frequently found in the surrounding landscape, but the introduced features remain subordinate to the overall visual strength of the characteristic landscape.

Modification (M). Provides for management activities that may visually dominate the original characteristic landscape. Activities which alter vegetative and landform character must borrow from the natural form, line, color and texture, and at such a scale that the resulting visual characteristics are those of natural occurences within the surrounding character type. Activities which introduce facilities are designed so that the resulting visual characteristics are compatible both in appearance and scale with the natural surroundings.

Maximum Modification (MM). Provides for management activities that may dominate the characteristic landscape when viewed as foreground or middlegrund, but must be congruent with the naturally established form, line, color and texture of the characteristic landscape when viewed as background.

Rehabilitation. A short-term management objective used to restore landscapes containing undesirable visual impacts to the desired visual quality level.

Enhancement. A short-term management alternative aimed at increasing positive visual variety where little variety now exists.

VISUAL RESOURCE CAPABILITY - The inherent capability of the land to produce attractive landscape and interpreted in terms of existing and potential variety classes as well as the lack of dominant unnatural-appearing visual alternative which cannot be rehabilitated and derived from the existing VQO inventory.

VISUAL RESOURCE SUITABILITY (VRS) - A combination of inventoried visual quality objectives and the visual absorption capacity (VAC). VRS is used to identify the probable degree of impact of proposed management activities and relative cost in meeting the VQO. The inventory VQO and VAC can be used to help determine both where it is appropriate to create and/or maintain natural appearing diversity as well as mitigate negative visual impacts.

-W-

WATER QUALITY STANDARDS - Standards prescribed and enforced by the Wyoming DEQ under the authority of the Clean Water Act and the Wyoming Environmental Quality Act. Surface waters are categorized as Classes I, II, III and IV; standards are class specific. Classes are defined as follows:

Class I - Those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. In designating Class I waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archaeological, fish and wildlife, the presence of significant quantities of developable water and other values of present and future benefit to the people.

Class II - Those surface waters, other than those classified as Class I, which are determined by the Wyoming Game and Fish Department to be presently supporting game fish or have the hydrologic and natural water quality potential to support game fish.

Class III - Those surface waters, other than those classified as Class I, which are determined by the Wyoming Game and Fish Department to be presently supporting non-game fish or have the hydrologic and natural water quality potential to support non-game fish.

Class IV - Those surface waters, other than those classified as Class I, which are determined by the Wyoming Game and Fish Department, to not have the hydrologic or natural water quality potential to support fish.

WATERSHED - The area above a given point on a stream that contributes water to the flow at that point.

WATERSHED IMPROVEMENT - Activities designed to improve the quantity, quality or timing of water yield and improve soil productivity.

WATER TABLE - The underground level at which water is found. This term is often used in connection with under-water supplies used for irrigation and industrial plants. Term also used to designate the top of the drilling derrick which supports the crown block.

WAY-OF-LIFE - In the present context, way-of-life refers to a means of deriving income or economic sustenance.

WETLANDS - Those areas inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence or vegetation or aquatic life that requires saturated or seasonally saturated soil conditions of growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats and natural ponds.

WHELPING SITE - A place where wild canines give birth to, nurse and rear their young.

WILDERNESS (Wilderness Area) - An area of undeveloped federal land designated as part of the National Wilderness System wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition; and (4) may also contain ecological or geological features of scientific, educational, scenic or historical value.

WINTER RANGE - Habitat used by wildlife species during the winter months to provide food and shelter.

VIII. INDEX

CHAPTER VIII

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APPENDICES

Draft Environmental Impact Statement
for the
Shoshone National Forest
Land and Resource Management Plan

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APPENDIX A

Issue, Concern, and Opportunity Identification Process

APPENDIX A

ISSUE, CONCERN, AND OPPORTUNITY IDENTIFICATION PROCESS

PROCESS

Formal public participation associated with the Forest Planning effort began on November 14,1980 with publication in the Federal Register of the Notice of Intent to Prepare a Forest Plan and EIS. Amended Notices of Intent were published on August 25, 1983 and December 17, 1984. In addition to the Federal Register Notices, various publics have been informed and asked to participate in the planning process, both formally and informally, through the news media, individual letters, personal conversations, newsletter, and meetings. These public participation and consultation activities have been the primary basis for defining public issues, management concerns, and management opportunities (ICO's).

PUBLIC ISSUES

Preliminary public issues for the Forest planning effort were developed from 1980 to 1981 using social resource management procedures developed by the Foundation for Urban and Neighborhood Development (FUND) of Denver, Colorado. (FUND guidebooks are contained in the Planning Records.)

Five Human Resource Units (HRUs) were delineated within the Forest's area of influence (see Chapter III, DEIS, Social Setting). District Rangers identified informal communication networks within each HRU, and through these networks, preliminary public issues were solicited and recorded (originals are on file at the Forest Supervisor's headquarters). The result of the preliminary issue development process was the identification of 203 public issues. (See Planning Action I, "Identification of Public Issues, Management Concerns and Opportunities", for detail.)

The identification of public issues has been an on-going process throughout development of the proposed Forest Plan. Intensive public involvement occurred as a result of the "Oil and Gas Exploration and Leasing Within the Washakie Wilderness" DEIS. This document details public involvement processes used. Issues were also identified during preparation of the "Geophysical Investigations for Nonwilderness and Non-Primitive Areas of the Shoshone National Forest" environmental assessment. As a result of a study regarding the reduction of human-grizzly bear conflicts, many other public issues were identified. Developing the draft EIS for the North Fork Well contributed additional insights into the issues needing to be addressed.

Following are some of the more significant formal public participation and consultation efforts aimed at identifying and refining public issues.

> In May 1981 an information pamphlet titled Oil and Gas Leasing Proposals Within the Washakie Wilderness was published and about 1000 copies distributed.

On June 30, July 1 and 2, 1981 open houses were held in Cody, Casper and Dubois, Wyoming, to exchange information regarding possible oil and gas leasing within the Washakie Wilderness.

In January 1982 public meetings were held in Cody, Casper and Dubois to discuss the draft EIS regarding oil and gas exploration and leasing within the Washakie Wilderness.

On March 21, 1984 a public meeting was held in Cody to answer questions concerning the draft EIS for the North Fork well. There were about 140 people in attendence. Issues and concerns expressed there assisted in refining and validating issues and concerns addressed in Forest planning.

On October 26, 1984 a Forest planning newsletter was distributed to interested individuals, organizations and agencies informing them of the status of the planning effort and asking for input to the process.

In October 1984 an information room was maintained in the Forest Supervisor's office to exchange information regarding Forest planning and to assist in defining and refining issues.

In March through May 1984, six meetings were held to estimate the social impacts of alternatives formulated for the draft EIS. Three meetings were held in Cody, two in Dubois, and one in Lander, Wyoming.

On October 27, 1983 a public meeting to initiate the scoping process regarding roadless area reevaluation was held in Casper. Even though this issue was resolved through passage of the Wyoming Wilderness Act of 1984, the meeting did contribute to refining other Forest planning issues.

MANAGEMENT CONCERNS

Preliminary management concerns were identified in 1980 and 1981 by the Forest. These concerns are documented and on file at the Forest Supervisor's headquarters. Concerns were based on factors such as laws, regulations and policy, public issues, past and present resource use trends, and future predictions.

Planning Action I, "Identification of Public Issues, Management Concerns and Opportunities" details the preliminary management concerns identified on the Shoshone National Forest. During the course of the planning process, management concerns were continually updated by the Forest.

MANAGEMENT OPPORTUNITIES

In 1980 and 1981, using the FUND procedures, the Forest defined management opportunities that responded to each of the previously identified public issues and management concerns. A total of 401 preliminary management opportunities were identified. As new or revised issues and concerns were identified during the course of the planning process, additional management opportunities were defined in response. (Planning Action I contains additional detail.)

SCREENING CRITERIA AND PROCESS

ICO's were analyzed to determine where and how they could best be resolved. Some ICO's could best be resolved through day-to-day management activities on the Forest. Others were most appropriately addressed by higher organizational levels within the Forest Service. Still others needed attention by other agencies or organizations. These ICO's were referred elsewhere and only those ICO's that could best be addressed and resolved through the Forest planning process were carried through.

Those ICO's assigned to Forest Plan resolution were evaluated with regard to extent, intensity and duration (according to FUND procedures). This evaluation rated (on a scale from one to ten) each ICO regarding response to the following questions:

1. How widespread is public interest in the issue?
2. What is the level of public interest or awareness of the issue?
3. How long will this issue remain a point of contention?

Many of the ICO's were found to address the same basic areas of concern, so they were synthesized into Issue/Concern Statements (included in Planning Action I). Eleven general areas of concern were identified, and eleven Planning Questions were developed to address ICO's. Management opportunities associated with each issue and concern were listed for each planning question. Each Issue and Concern was favorably addressed by at least one Planning Question and in turn became a facet of that Planning Question. (Planning Action I includes a complete listing of the Planning Questions and the ICO's addressed by each.)

The planning questions were used as a basis for problem definition and the subsequent development of planning problem statements. These statements were written to completely define the problem and translate its solution into a forest condition statement. The forest condition statement was then used as the basis for prescription development.

CONSULTATION WITH OTHERS

In an attempt to identify planning efforts of other agencies and Indian tribes, ascertain how Forest management practices might affect other agencies, and to invite coordinated resource management efforts, contacts were made with other agencies and Indian tribes within the Forest planning area.

Plans and statements of land use policy from other agencies were reviewed in the course of the planning effort. In many cases, information in these documents was incorporated directly or indirectly into the Forest Plan. In addition, the documents were reviewed to determine possible areas of conflict with Forest management practices.

Since the ICO identification process began, many formal and informal contacts and discussions have been held with federal, state and local agencies regarding the Forest planning effort. Documentation of these contacts are in the Planning Records in the Forest Supervisor's headquarters.

Following is a list of the more significant contacts between the Forest and other agencies.

In November 1981 the Forest met with representatives of the U.S. Fish and Wildlife Service. This meeting involved informal consultation on the planning process and analysis, and the T&E species of concern and how they would be addressed.

Beginning in 1980 and continuing throughout the Forest planning process, numerous informal contacts have been made with local Wyoming Game and Fish Department personnel to gather data on wildlife habitats, populations (existing and desired), grizzly bear management and protection, and mitigation standards and guidelines for various management activities.

In July 1984 the Forest met with Bridger-Teton National Forest biologists and foresters to coordinate the timing of timber sales to resolve emerging wildlife issues.

The following plans and land use policies of other agencies were reviewed during the planning process.

A Strategic Plan for the Comprehensive Management of Wildlife in Wyoming, 1978-1983. Wyoming Game and Fish Department. Volume II.

Comprehensive Wildlife Management Plan for National Forest System Lands in Wyoming. Wyoming Game and Fish Department and USDA Forest Service. Revised 1980.

Continental Divide National Scenic Trail Comprehensive Plan. USDA Forest Service, Recreation and Lands, Region 2. Denver, Colorado.

Endangered and Threatened Wildlife and Plants. 50 CFR 17.11 and 17.12. USDI, Reprinted January 1, 1982. U.S. Fish and Wildlife Service.

Grass Creek Grazing DEIS. USDI, Bureau of Land Management, Worland District, Wyoming. 1982.

Grizzly Bear Recovery Plan. USDI Fish and Wildlife Service, 1982.

Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area. U.S. Forest Service and National Park Service. December, 1979.

National Register of Historic Places. USDI National Park Service, Washington.

Northern Rocky Mountain Wolf Recovery Plan. Northern Rocky Mountain Wolf Recovery Team. Approved by U.S. Fish and Wildlife Service. 1980.

Whiskey Mountain Big Horn Sheep Comprehensive Management Plan. U.S. Forest Service, Wyoming Game and Fish Department, and Bureau of Land Management. 1979, Revised 1984.

Wyoming State Comprehensive Outdoor Recreation Plan. Wyoming Recreation Commission/Oblinger-McCaleb. 1980.

208 Statewide Water Quality Management Plan for Wyoming. Wyoming Department of Environmental Quality. 1979.

Big Horn Basin 208 Water Quality Management Plan. Regional Planning Office/Cooper, through U.S. EPA and Wyoming DEQ. August 1979.

The Wyoming Framework Water Plan. Wyoming State Engineer. 1973.

Memorandum of Understanding Between the Forest Service, USDA, and the Wyoming Department of Environmental Quality Representing the State of Wyoming. Water Quality Management. 1981.

Formal and informal contacts have occurred during the planning process with interest groups, landowners and industries; documentation of those contacts are in the planning records in the Forest Supervisor's headquarters. They are summarized under public issues earlier in this appendix.

SELECTED ISSUES, CONCERNS AND OPPORTUNITIES (ICO's)

The public issues, management concerns and management opportunities (ICO's) providing the basis for the Forest Plan alternatives are included in the following Planning Problem Statements. An analysis of the Management Situation was conducted (Planning Action IV, on file in the Supervisor's Office) to determine opportunities available to the Forest to supply goods and services in response to ICO's. Each planning problem includes a discussion of the major ICO's.

Issues and Concerns deferred for resolution outside the Forest planning process were identified during the development of ICO's (Planning Action I). If the ICO's were not within the management control of the Forest, they were not included in the Plan. ICO's that were within the management control of the Forest, but that were of an extent, intensity or anticipated duration that would not warrant long-term resolution in the Forest Plan, were also not included.

The issue of the opportunity cost of wilderness was not considered in the planning process. Each area designated as wilderness was done so on an area by area basis by Congress. They determined, for those areas being designated as wilderness, that there was sufficient opportunity cost information upon which to base a decision and that decision was to designate those areas as part of the National Wilderness System. Therefore, opportunity cost of wilderness was not examined as an issue.

ICO's related to hard rock minerals, ski area development and expansion, use of chemicals in vegetation treatment, utility corridors, and National Recreation Trails were not considered significant and were eliminated from the scope of the EIS.

Those issues, concerns and opportunities (ICO's) determined to be appropriate to address in the Forest planning process were the basis for formulating the Forest Plan alternatives. These ICO's fell into two general categories: 1) ICO's treated the same way in all alternatives and 2) ICO's treated differently in the design of various alternatives.

ICO's treated the same way in all alternatives are: 1) those that are resolved or addressed by specific laws or regulations. Included in this group are ICO's pertaining to wilderness management, threatened and endangered species protection, water quality, air quality, cultural resource management, and wild and scenic river management (for segments determined eligible for inclusion in the National Wild and Scenic River System). Other ICO's treated the same way in all alternatives are: 2) those that could be adequately addressed with a single treatment or those regarding resources that require a specific type of treatment or protection. ICO's included in this group are those pertaining to minerals management, special land uses (i.e. utility corridors), riparian area protection, fire management and visual resource management. In addition, ICO's pertaining to human and community development programs are treated the same in all alternatives except the reduced budget alternative (no budget for these programs eliminated them). All Forest Plan alternatives are characterized in the same way in terms of the ICO's listed above.

ICO's that could be addressed or resolved in various ways were also used to characterize alternatives; the variability in management or treatments to address these ICO's accounts for the differences between alternatives. ICO's that were treated differently in the design of various alternatives included those pertaining to amount and type of dispersed and developed recreation opportunity, wildlife habitat improvement, livestock grazing, amount and type of timber harvest, water yield, facility development and maintenance (including roads), travel management, rights-of-way acquisition, land purchase and exchange, land line location, occupancy/trespass resolutions, insect and disease treatment, and threatened and endangered species management.

Benchmark level analyses were performed to derive reference points with which Forest Plan alternatives could be compared and to define a range of outputs within which reasonable alternatives could be constructed (See Chapter II for detail). A minimum level benchmark established the long-term fixed costs of public ownership of the Forest. Two maximum present net value (PVN) benchmarks were established (one for market outputs only and one for both market and non-market outputs). In addition, benchmarks were established for maximum timber level, wilderness recreation use level, wildlife habitat improvement level and water yield level. Within the decision space defined by these benchmarks, alternatives to respond to the ICO's were constructed.

The maximum output level of any one resource can be obtained only at the expense of other outputs or resources. If range use is maximized, for example, it will be at the expense of wildlife and recreation. The production of some other resource outputs, on the other hand, are especially compatible with other resource uses; maximum water yield management, for example, compliments timber production. Alternatives were constructed to strike different balances between the competitive and complementary opportunities available to the Forest to produce goods and services and to respond to ICO's.

PLANNING PROBLEM STATEMENTS

Planning Problem Statement #1 - Balanced Timber Management for Multiple Resource Needs. Issues and concerns include those pertaining to maintaining a healthy forest, healthy local economy, and to reducing conflicts between timber management and other activities. Timber management and associated roads can reduce visual quality and other recreational values. Similarly they can reduce wildlife habitat quality and contribute to loss of important habitat components. Timber harvest and roads can produce conditions that decrease the productivity of soils and the quality of water. On the other hand, such activities can enhance habitat for some wildlife species and provide access for many activities including recreation.

Currently there are eight sawmills using timber from the Shoshone National Forest. Most of these mills are processing less than one million board feet per year. Most mills also depend to some extent on timber from sources other than the National Forest System. In many cases, the timber available to these mills is less than their capacity. Public attitudes toward timber harvesting are currently divided. Many publics feel timber harvesting on low productivity lands, such as the Shoshone National Forest, is inappropriate. Many local residents favor increased timber harvesting in order to maintain a healthy forest and a healthy local economy. The mountain pine beetle is a continuing problem in many lodgepole pine stands.

Analysis of present vegetation management and other resource needs on the Forest indicates that there are a number of coordinated resource opportunities available. Timber can continue to be a part of local industry if harvesting is designed to maximize economic efficiency and to accomplish other resource needs as well. Vegetation management must be used to maintain a healthy forest environment without impairing aesthetic values.

Planning Problem Statement #2 - Adequate Variety, Amount, Dispersion and Quality of Recreation Opportunities. Issues and concerns include those pertaining to: conflict between incompatible recreation activities such as cross-country skiing and snowmobiling; development of resource management practices which are compatible with recreation opportunity settings; access and resource use conflicts; and perceived quality of recreation opportunities. The quality and amount of dispersed, nonmotorized forms of recreation where solitude and natural conditions are key can be reduced by the presence or evidence of livestock, by the presence of trailbikes or snowmobiles, and by the evidence of timber harvest or mineral exploration. Both motorized and nonmotorized recreation can adversely affect wildlife, or even be critical to wildlife at some times or in some places. Snowmobilers, trailbikers and other ORV groups may perceive that there is insufficient opportunity for pursuing their recreational choices on the Forest because of road and area closures. Closures are implemented for a variety of purposes including wildlife protection, watershed protection, and reduction of road maintenance expenses. These problems exemplify the complex nature of the management problem and how a truly integrated approach to management is required. The concern and the management challenge is to provide a mix of recreation opportunities that is satisfactory to the public that facilitates the efficient management of other resources, and that provides resource protection where necessary.

Pressure on the Forest to provide accomodations for visitors to Yellowstone National Park is increasing. With the proposed improvement of the Wapiti and Clark's Fork roads, demand for camping at the east and northeast Park entrances will become greater. The question of how much the Federal government should provide versus private capital will continue to be asked. Demand for commercial outfitter services will continue to increase, compounding the problem of outfitters operating without a permit.

Demand for suitable off-road vehicle (ORV) areas and other motorized recreation opportunities are increasing. There is a need to expand and improve the limited winter recreation programs Forest-wide. Additional demands are expected on lodges and resorts for both expanded and improved destination type services as users become more conscious of fuel conservation needs. Demand for other resource uses such as oil and gas exploration and development, domestic livestock grazing, and timber harvesting conflict with some recreation uses of the Forest. These conflicts are polarizing public attitudes towards management of the Forest.

An analysis of all forms of dispersed recreation indicates that use will increase to 680,000 RVD's by the year 1990. The Forest can provide for this increase if management for other resource uses is designed to accomodate dispersed recreation resource needs and to minimize the conflicts that occur between resource users. An analysis of existing and potential developed recreation facilities and projected demand indicates that the Forest could accommodate peak use of campgrounds and picnic areas only at great expense. There is potential for additional or expanded ski areas. However, private investment is required to realize this potential. Private recreation residence owners may continue to have conflicts with other Forest users, since the Forest Service has no way to ensure that other Forest uses and users do not trespass on these properties. Analysis of present and projected travel on the Forest indicates that a comprehensive travel management plan is needed. The Forest can provide motorized access to many areas, but protection of other resources, wildlife needs, safety hazard reduction and road maintenance costs will require seasonal or year-long motorized closure of some areas, roads and trails.

Planning Problem Statement #3 - Adequate Level and Kind of Livestock Grazing. Issues and concerns include those pertaining to resource use conflicts, range resource management, economically dependent ranchers, and kind of livestock use (sheep versus cattle). Improper livestock use can compete with wildlife for crucial winter range and conflict with some recreation uses, such as dispersed wilderness use. Excessive or overly concentrated grazing can damage some soil properties that lead to increased erosion and sedimentation. Excessive use in riparian areas can bring about drastic changes in that ecosystem by vegetation type conversion, stream bank failure and physical, chemical and biological alterations in water quality. Opportunities do exist, however, to improve current grazing management and reduce livestock conflicts with other Forest resources. Use of intensive management systems can do much to make livestock grazing more compatible with other uses. Some ranchers having Forest grazing permits are economically dependent on these permits for the continuation of their operations. Demands for sheep grazing is declining; pressure to convert to cattle grazing on many sheep allotments is increasing.

An analysis of existing and projected grazing use and available forage indicates that the Forest can accomodate a small increase in grazing. This may, however, require stricter enforcement of grazing policy to ease conflicts with recreationists and to prevent damage to riparian areas and fragile ecosystems. There is little likelihood that Forest funding will allow for extensive fencing of sensitive ecosystems such as riparian areas.

Planning Problem Statement #4 - Manage Wilderness to Best Satisfy Legal Requirements and Public Needs. Issues and concerns include those pertaining to conflicting use of wilderness resources, quality of wilderness values and experiences, and effects of fire policy and commodity related activities in or adjacent to wilderness.

Grazing in wilderness is not accepted by many wilderness recreation users as being compatible, since it represents evidence of man's activity. These users contend grazing and evidence of grazing can lower the quality of wilderness resources, such as soil, vegetation and water, as well as the quality of the recreation experience. On the other hand grazing is a viable wilderness use according to the Wilderness Act of 1964. Therein lies a conflict from the standpoint of both desired recreation opportunity and maintenance of livelihood. On a somewhat smaller scale, a similar conflict can occur between individuals or small groups and large, horse-supported groups including outfitters and guides. The management concern is to accomodate all such desires and uses at a high level of quality, and protect the sensitive wilderness ecosystems and habitats in a economically efficient way. Though not a major problem at this time, minerals development in wilderness is a management concern and a potentially volatile issue.

There are currently five wildernesses and one wilderness study area on the Forest. Passage of the Wyoming Wilderness Act of 1984 added 142,238 acres to existing wilderness for a total of 1,379,048 acres (56.7 percent of the Forest net acreage). An additional 14,700 acres was established as the High Lakes Wilderness Study Area. The Dunoir (28,987 acres) was not classified as wilderness, but the provisions of P.L. 92-476 still apply. The result of the Wyoming Wilderness Act of 1984 is that two areas remain unresolved; the High Lakes Wilderness Study Area and the Dunoir Special Management Unit. The Act delays resolution of the High Lakes Area (10-15 years from 1985). The Dunoir Special Management Unit was kept in the status of P.L.92-476. Both areas must be managed for retention of their wilderness characteristics, knowing each area has varying activities that may take place prior to final resolution (See directiont for Management Area 10E and 10F, Chapter III of the Forest Plan).

Public attitudes toward wilderness management are divided. Many users favor a wilderness with few or no developments while others are demanding more comforts and conveniences such as trails. Conflicts among users and uses are occurring as wilderness visits increase. Off-forest developments such as gas sweetening plants may affect wilderness air quality and other related values. Some opportunities for cooperative management of the Whiskey Mountain bighorn sheep herd are forgone with designation of the Glacier Primitive Area as part of the Fitzpatrick Wilderness. Public attitudes on wilderness management will continue to be divided.

Planning Problem Statement #5 - Adequate Level of Road and Trail System Development and Maintenance. Issues and concerns include those that pertain to the number, mileage, and design standard of roads and trails, maintenance of existing facilities, standards for construction and the need for obliteration and revegetation on some roads. They also pertain to the need for motorized and right-of-way access to public land for various purposes. Immediate concerns relate to motorized recreational use from the standpoint of resource protection and maintenance of the transportation system with a shrinking budget. The discussion under problem statement two elaborates on these concerns.

In the past, roads on the Forest have been developed primarily for timber and prospecting access. Most of the system roads currently being constructed on the Forest are associated with timber sales. The relatively large mileage of trails and small mileage of roads, when compared to other Forests, reflect the predominately wilderness and roadless nature of the Shoshone National Forest. Some resource damage has occurred in the past from poorly constructed and maintained roads, failure to properly rehabilitate abandoned roads, and driving on closed roads. In the past few years, several abandoned roads have been rehabilitated to halt or prevent erosion and for wildlife purposes.

Demand is increasing on the Forest for recreational road access for motorized recreation and trailhead access. Much of the Forest has little or no right-of-way access through private lands adjacent to the Forest. Use of the private lands within and adjacent to the Forest is intensifying. The result is that rights-of-way and easements are becoming more difficult to obtain.

An analysis of present and projected facility needs indicates that the Forest can provide adequate roads and trails to meet most public and resource needs, but it cannot provide enough roads or road maintenance to satisfy all demands. A carefuly designed road and trail system is needed to meet multiple resource needs. The Forest cannot, however, provide unlimited access to public land over private land, nor will funding allow fencing of all private/Forest shared boundaries.

Planning Problem Statement #6 - Adequate Levels and Quality Habitat for Wildlife and Fish. Issues and concerns include those pertaining to the number of wildlife and fish available for consumptive and non-consumptive uses, and conflicts between wildlife and Forest users, and uses that tend to decrease habitat quality and quantity. The major concern or conflict revolves around the treatment of winter range for elk, deer, sheep and moose that is considered crucial to herd maintenance. There is a direct conflict between the protection for forage and security in such areas and providing forage for cattle, opportunities for motorized recreation (such as snowmobiling) and access to year-round operations like oil and gas exploration and production facilities.

Most big game populations are considered to be at or near the carrying capacity of the key winter ranges at the present time. Fisheries have generally been increased primarily due to stocking programs by the Wyoming Game and Fish Department. There has been some habitat loss due to competing land uses such as livestock grazing, road construction, mineral exploration, and fire control and by natural causes such as loss of aspen stands. Seasonal wildlife distribution patterns (primarily elk) have changed in areas such as the South Fork of the Shoshone River due to increased recreation. The demand for both consumptive and non-consumptive wildlife use can be expected to increase significantly in the next decade. The amounts and methods of predator control will continue to be a controversial issue necessitating increased coordination with the U.S. Fish and Wildlife Service, Wyoming Game and Fish, Forest Service Research, wildlife organizations and livestock owners.

An analysis of existing and potential habitats on the Forest indictes that adequate habitat for all species of native wildlife can be provided only through coordination with other Forest resource needs. Winter range is a limiting factor on big game herds, and coordination with private land owners adacent to the Forest is needed to maintain an adequate amount of winter range.

Planning Problem Statement #7 - Manage Threatened and Endangered Species Habitat to Achieve Recovered Populations. Issues and concerns include those pertaining to management practices that affect grizzly bear, bald eagle, gray wolf, peregrine falcon, and black-footed ferret. As in the discussion of problem six, above, the major concern involves protection of areas that are critical to these species. These areas include not only nesting or denning sites, but protection of their food sources. Since these species are basically predators, the additional concern is to protect the habitat of other wildlife species (including small game) and fish upon which they depend. Such protection is in conflict with many other uses of the Forest, the most notable of which is probably recreation (both developed and dispersed). Oil and gas activities (including seismic studies) and timber harvest, both highly dependent on road construction and use, are potentially in conflict with threatened and endangered species protection. Large-group, horse-supported camps and developed public and private recreation near occupied grizzly bear habitat produces grizzly/human conflicts that sometimes results in human injury or fatalities and nearly always results in the loss of the bears from the ecosystem.

Areas of suitable habitat for peregrine falcons have been mapped on the Forest. Bald eagles are occasionally sighted on the Forest and their habitat has been delineated. Reintroduction of the gray wolf may occur on the Forest when the Recovery Plan for that species is implemented. A population of black-footed ferrets has been found within three to five miles of the Forest Boundary.

Considered a part of the Greater Yellowstone Area for grizzly bear management, the Shoshone National Forest contains one-half million acres of "essential grizzly habitat" and one million acres of "occupied grizzly habitat". The Shoshone National Forest, along with five other National Forests and Yellowstone and Grand Teton National Parks, have cooperated in developing and implementing "Guidelines for Managing Grizzly Bear Habitat" and the "Grizzly Bear Recovery Plan". The primary objective of the guidelines and recovery plan is removing the grizzly bear from threatened status. Restrictions that are imposed to meet this objective inhibit other Forest uses such as grazing and commercial outfitting.

Planning Problem Statement #8 - Adequate Quality, Quantity and Timing of Water Yields for Forest and Non-Forest Uses and Other Downstream Uses off Forest. Issues and concerns include those pertaining to timing, available storage of existing and increased quantities of water, instream flow needs, maintenance of water quality, watershed management techniques and administration of water on and off the Forest. Water quality can be affected by all commodity-oriented activities on the Forest, and by some noncommodity activities such as dispersed recreation. Changes in water quality can affect water uses quite distant from the source of the impact. Water quality can also be lowered significantly, to the point of violating quality standards for various uses, by the cumulative impact of many activities that individually are of little consequence. The major concern is to avoid changes in water quality that will significantly affect water uses or violate standards. The major issue or management challenge is to define acceptable levels of management, and where and when various management practices can occur to address that concern.

The Shoshone National Forest produces an annual average yield of over three million acre feet of water per year. Historically, little consumptive water use has occurred on the Forest, with the exception of some recreation (campground), stock developments, and administrative water uses. Off-forest water use, however, is expected to increase with population growth, increased energy water use, and additional irrigation developments. Most of the rivers flowing off the Forest eventually flow into large multipurpose hydroelectric irrigation reservoirs. The Forest can expect additional demands for increased diversions and reservoir development, due to the suitability of a number of sites for that purpose.

The Forest has a large instream flow requirement for ecosystem maintenance, fisheries, wildlife, livestock use and aesthetics. Instream quantities for maintenance of favorable conditions of flow have been provided by the recent Big Horn Adjudication (see Chapter III, Water).

An analysis of present and projected demand for water in the Forest's area of influence indicates that there is a need for maintenance of high quality water and an increase in water storage facilities. Some modest increases are possible, but the cutting techniques used to acquire the increases must be carefully applied to protect other Forest resource values. Water quality on the Forest must adhere to Wyoming water quality regulations, and cooperation will be needed between the State, the public, and the Forest Service if new storage and/or transmission facilities are to be built.

Planning Problem Statement #9 - Adequate and Appropriate Fire Management - Issues and concerns include those that pertain to protection of private property within or adjacent to the Forest, increasing fuel loads, initial attack responsibilities, and effects of present fire management policies. The issue is: to what degree is protection needed, considering various land uses and considering fire as a component or regulator of the ecosystem. The management concern is to bring policy and expenditures into line with those considerations, and define the conditions under which suppression is truly necessary.

An analysis of the present and projected fire situation on the Forest indicates that wildfire risk can be reduced by reducing fuel loads with increased fuelwood gatherering, road closures and improved timber management practices.

Vegetation management through the use of fire is now being used to accomplish other resource objectives. Naturally occurring fires can also be used to manage vegetation and maintain desired ecosystem conditions, especially for those in which fire is a natural, periodic event.

Wildfires that do occur would be less severe in managed, rather than unmanaged, areas. There is also an opportunity to use fire (i.e., prescribed burns) to accomplish other resource objectives.

Planning Problem Statement #10 - Appropriate Level of Rights-of-Way Acquisition, Land Adjustments and Special Land Uses - Issues and concerns include those that pertain to conflicts between private land owners and people who want additional access to public land, land-line location and trespass issues in subdivision areas, and special use needs that accompany increasing population and resource development.

The land ownership pattern of the Shoshone National Forest is such that about 33,000 acres of state-owned and private land lie within its boundaries. As recreation use increases and user values change, many landowners have fenced their lands and locked their gates. Landowners have realized benefits through charging fees for use of their private roads for access to National Forest System and other public lands. Recreationists and other Forest users are now more mobile and aware of their rights. They are looking to the Forest Service to step up right-of-way acquisition programs to insure access to public lands. It is expected that landowners will continue to lock their gates and prohibit access. Conflicts between landowners and recreationists will increase as recreation use increases. In addition, access needs and Forest landline location activities will expand in association with intensified management of various other resources such as timber, forage and minerals.

Analysis of present and projected land related issues and concerns indicates that there will be increasing need for rights-of-way acquisition, land-line location, and land purchase and/or exchange. The Forest can meet these needs only on a priority basis as funding permits. Transportation easements and utility corridor can be established, but they will affect visual quality and other resources. Opportuniies to combine use of corridors can be identified.

Planning Problem Statement #11 - Mineral Exploration, Development and Extraction - Issues and concerns include those pertaining to the exploration for and development of leasable and locatable minerals, reclamation of disturbed areas, needs for Forest access to support minerals and other activities, conflicts with other resource uses and values, and social effects of rapid development. A concern is that all phases of mineral operations can have long term adverse consequences on wildlife habitat and populations, including T & E species. They can also severely disrupt visual and aesthetic qualities of an area. A wide range of impacts on aquatic ecosystems and water quality is possible from individual sites, spill events or the cumulative effects of development. Another concern is that opportunities for energy development or discovery of new major sources of oil and gas may be foregone. At issue is the relative importance of surface resource values and qualities, aesthetics, and energy supplies. The frame of reference for the issue is both local and national.

APPENDIX B

Description of Analysis Process

APPENDIX B

DESCRIPTION OF ANALYSIS PROCESS

INTRODUCTION

The general planning problem is to develop, adopt and provide for revising a plan that will guide all natural resource managment activities and establish management standards and guidelines for the next ten to fifteen years for the Shoshone National Forest with projections through the year 2030. The plan will determine resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management. The plan must provide for multiple use and sustained yield of goods and services from the Forest in a way that maximizes long term net public benefit in an environmentally sound manner.

Solving a problem of this magnitude requires that large amounts of data pertaining to Forest resources and many socio-economic factors be compiled and analyzed. A number of analytical models and computerized databases were used to guide compilation of this data and to organize it in a manageable format. Use of these models and databases are discussed in this appendix. The purpose of this compilation and subsequent analysis is to provide clear, objective information on which to base judgements as to what will yield the maximum net benefit to the American public.

The actions in this analysis process are specified in 36 CFR 219.12:

1. Identification of Purpose and Need. The Interdisciplinary Team identified and evaluated public issues, management concerns and resource use and development opportunities. The Forest Supervisor determined the major public issues, management concerns and resource use and development opportunities that would be addressed in the planning process.

2. Planning Criteria. Criteria were prepared to guide the planning process. These criteria apply to collection and use of inventory data and information, analysis of the management situation, and the design, formulation and evaluation of alternatives. Criteria designed to achieve the objective of maximizing net public benefits were included.

3. Inventory Data and Information Collection. Current inventory data and information appropriate for planning were collected and stored for ready retrieval and comparison - they are periodically evaluated for accuracy and effectiveness.

4. Analysis of the Management Situation. An analysis of the management situation (Planning Action IV) was conducted to determine the ability of the Forest to supply goods and services in response to society's demands. The primary purpose of the analysis was to provide a basis for formulating a broad range of reasonable alternatives.

5. Formulation of Alternatives. The Interdisciplinary Team formulated a broad range of reasonable alternatives (according to NEPA procedures) to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits, consistent with resource integration and management requirements.

6. Estimated Effects of Alternatives. The physical, biological, economic and social effects of implementing each alternative considered in detail were estimated and compared according to NEPA procedures. These effects included expected outputs to RPA targets, direct and indirect benefits and costs, and signifcant resource tradeoffs and opportunity costs associated with achieving alternative resource objectives.

7. Evaluation of Alternatives. Using planning criteria, the Interdisciplinary Team evaluated the significant physical, biological, economic and social effects of each management alternative considered in detail. The evaluation included a comparative analysis of the aggregate effects of the management alternatives and compared present net value, social and economic impacts, outputs of goods and services, and overall protection and enhancement of environmental resources.

8. Preferred Alternative Recommendation. The Forest Supervisor reviewed the Interdisciplinary Team's evaluation and recommended a preferred alternative (Alternative D) to the Regional Forester. The preferred alternative is identified in this draft EIS and is displayed in the proposed Forest Plan.

9. Plan Approval. The Regional Forester will review the proposed Forest Plan and the final EIS and will either approve or disapprove the Plan. The Record of Decision for approval of the Plan will include a summarized comparison of the selected alternative with (1) any other alternative considered which is environmentally preferable to the selected alternative and (2) any other alternative considered which comes nearer to maximizing present net value.

10. Monitoring and Evaluation. At established intervals, implementaion of the Forest Plan will be evaluated on a sample basis to determine how well objectives have been met and how closesly management standards have been applied.

As stated earlier, the focus of this appendix is on the analytical process used to complete actions 2 through 7 above. This process used many different types of models and analytical procedures for data storage, retrieval, and processing. Use of these models and procedures enabled the interdisciplinary team to compile and analyze a vast amount of data and provide information. Powerful as these models and procedures are, though, they and their results are not perfect representations of the Forest nor of the factors affecting and effected by management of the Forest. Because of this, there is the need to carefully interpret results of any analysis. These results, at best, can be used for dealing with the relative differences and not absolutes. As such, they can not be taken literally. Analysis tools and their results do provide information for making decisions. But this information must be tempered by judgements based on professional experience leading to decisions throughout planning. Throughout this appendix, discussions focus on the analytical processes and their results as if these are the only factors considered in reaching a decision regarding which alternative maximizes net public benefit and the final configuration of that alternative. It is important to remember that these processes provided information on which decisions are based, but they did not make the decisions.

PLANNING CRITERIA

Planning criteria specify the analyses to be done as part of Forest Planning and the data requirements for these analyses. An overview of major criteria for identification of inventory needs and analyses is presented here. Full documentation of all criteria is located in a report titled "Planning Action 2" stored in planning records.

IDENTIFICATION OF INVENTORY NEEDS

Data requirements of analysis tools needed to address issues, concerns and opportunities (ICOs) were the basis for identifying inventory needs. Major steps in this process are as follows:

Issues, concerns and opportunities were identified as outlined in Appendix A.

Each ICO was examined and when two or more dealt with the same problem, they were grouped.

A problem statement was developed for each of these groupings. These statements included a preliminary specification of a forest condition that would resolve the problem. For example, a forest condition that responds to ICOs related to producing timber on a sustained basis is to have some portion of the Forest in a regulated condition; i.e. an even distribution of age classes that are fully accessible, with stocking and timber types controled.

These forest condition statements were then examined to identify if they could be combined to solve multiple problems simultaneously. For example, by specifying that the roads used to access timberlands in the regulated portion of the Forest meet specifications for use by recreationalists, a single forest condition could be developed which resolved problems associated with production of timber and production of areas for motorized recreation. A total of 55 combined forest conditions referred to as Goals were developed in this way.

Each of these goal statements specified the type of land on which it could be achieved; e.g. tentatively suitable timber land, suitable rangeland, high quality riparian areas, crucial preferred elk winter range, etc. Inventory items necessary for identifying these land types were listed as inventory data needs.

Another part of problem statements was an identification of quantifiable items that if estimated for each benchmark and alternative would give an indication of how that problem was handled in a benchmark or alternative. For example, for the problem related to production of timber, quanitifiable items necessary for identifying how it was handled in an alternative included: timber volume produced; value of that volume; costs of producing that volume; and location of production in terms of market areas. For each of the items listed in problem statements, the procedure that was going to be used to estimate its value for a particular alternative were identified; e.g. to estimate timber volume, R2GROW, a timber estimation model, was identified. The data requirements for each of these models was then added to the list of inventory data needs.

This combined list was the list of inventory data requirements used for planning on the Forest.

The next major section of this appendix descibes all data used and how it was compiled and stored. Full documentation of this can be found in Planning Records.

OVERVIEW OF ANALYSIS PROCEDURE

The analysis procedure used was a multi-stage, multi-faceted analysis. It involved 2 economic input-output models, 3 separate linear programming models, a social impact analysis technique, many simulation and estimation models, and a data and information system composed of a computerized data base and many map overlays. The central analysis procedure involved the 3 linear programming models.

A linear programming model named FORPLAN was developed by the Forest Service as an analysis tool for Forest Planning. The Shoshone used version 2 of FORPLAN to build three separate models for various stages of analysis. Version 2 FORPLAN (V2) is a very flexible tool that provides capabilities for tailoring analysis to address specific problems on a Forest. Each Forest is responsible for defining the way FORPLAN features will be used (i.e. the structure of the model) to address the specific planning problems derived from issues, concerns and opportunities. The basic elements of a FORPLAN model are: areas of land for which management strategies are developed, these are called analysis areas; prescriptions which are the management strategies applied to analysis areas; and estimates of the costs and effects of applying the practices included in a prescription to a specific analysis area. These elements are discussed briefly in this overview and in greater detail in subsequent sections of this appendix.

Analysis areas are delineated portions of the Forest for which management strategies are developed. In FORPLAN models used on the Shoshone, two types of analysis areas were used. The first type of analysis areas are large (10,000 to 50,000 acres), contiguous areas on the Forest. Each of these typically include the winter range of a herd unit of wildlife, one or more small watersheds, a grazing allotment, and an area served by a major portion of the Forest transportation network. Using this type of analysis area provided the ability to develop multiple-use management strategies where all practices involved in managing that area could be coordinated in a cost efficient manner and the major effects on production of goods and services including cumulative impacts could be estimated. The second type of analysis area dealt exclusively with timber. These analysis areas were stratified by existing timber types, age class, location on the Forest, and a timber land type which combined characteristics important to the development of possible management strategies and estimation of outputs. Use of this second type of analysis area provided the ability to capitalize on FORPLAN features that would generate all necessary timing options for solving the timber harvest scheduling problem. A link between the two types of analysis areas was built into FORPLAN models used on the Forest so that management of timber, development of transportation systems, and management of the non-timber portion of the Forest could be coordinated.

Prescriptions are composed of practices selected and scheduled to achieve production of a multiple-use mix of goods and services if applied to an analysis area. Prescriptions developed for the cohesive analysis areas included such practices as recreation management, range management, development of road and trail networks, maintenance of administrative sites, and wildlife management. Prescriptions for timber analysis areas included practices associated with timber management using a variety of standards and guidelines as needed to enhance production of differing mixes of multiple-use goods and services.

Coefficients entered into FORPLAN represent the costs and resulting effects of applying a prescription to an analysis area. To account for costs of practices, over 70 types of catagories of practices were included in FORPLAN. The cost coefficients were determined by the interdisciplinary team working with District personnel. These cost estimates varied depending on the types of management planned within a prescription and efficiencies of coordinating management activities. Because analysis areas were large, contiguous pieces of ground, estimates of such outputs as recreation visitor days, visual quality, effects on wildlife herd units, and road and trail needs were relatively easy to determine and enter into FORPLAN on a prescription by prescription basis. Over 70 catagories of outputs were estimated and modeled in FORPLAN. Estimates of outputs were done by the interdisciplinary team and District personnel based on the management strategy of each prescription, inventoried features of the analysis area that prescription was developed for, outputs of estimation models, and use of specific studies done on the Forest.

A linear programming model is used to optimize achievement of a desired set of objectives. There are two ways telling the model what the objectives are for a given benchmark or alternative. The first is referred to as the objective function. The objective function is whatever a benchmark or alternative is to maximize or minimize; e.g. maximize timber, maximize forage production for domestic livestock, or maximize economic efficiency. All final benchmark analysis and analysis of alternatives used the objective function of maximizing economic efficiency. The second way of entering objectives is the use of constraints. Constraints set the conditions to be met under which optimization can occur.

As stated, formulating an alternative that will maximize net public benefit is the objective of Forest Planning. This is a complex problem requiring consideration of many factors that surround management of the Forest. A multi-staged linear programming analysis was used to bring this complexity to managable levels. The three stages of linear programming analysis were:

> a steady state model - this model was used to sort through all reasonable management strategies and sets of coordination requirements to identify those that resolve problems in a cost efficient manner. The management strategies and their accompanying standards and guidelines chosen at this stage were the ones passed on to the third FORPLAN model for analysis of benchmarks and alternatives.

a timber harvest scheduling model - this model concentrated on analysis of management strategies for the tentatively suitable timberland. It was used to analyze the effects of using rotation ages that were shorter than culmination of mean annual increment and to analyze the effects of timber dispersion standards built into the third FORPLAN model.

a final model - this model incorporated those strategies identified in the steady state model and dealt simultaneously with selection of the most appropriate strategy for each analysis area and timber harvest scheduling for each benchmark and alternative.

Use of these three models provided a mechanism for developing cost efficient management strategies for resolving problems facing management of the Forest. This multi-stage approach proved to be a relatively easy process to implement and led to the development of a linear programming model that was easy to understand by those who built it and for members of the public and interest groups. Further, this multi-staged approach provided a mechanism for incorporating all significant costs and benefits which obviated the need to do any of the cost efficiency analysis outside these linear programming models.

Inconjunction with these three models, 2 economic impact models were developed: one for Fremont County and one for Park County Wyoming. Even though the Forest is located in 5 counties, the economic and social impacts on the other three counties are negligable. These 2 models were "hybred" models; meaning that both primary and secondary data were used for their construction. This provided the mechanism for dealing with standard analysis requirements while tailoring analysis to address problems specific to the Forest.

A social analysis procedure developed by Dr. David Freeman of Colorado State University was used. This procedure was adapted for use in Forest Planning by Charles Palmer and Tom Mitchell and is documented in Appendix F. This procedure focussed on assessing the relative amount of polarization in local communities that would be caused by each alternative. This provided a basis for assessing impacts of alternatives on such things as lifestyles, attitudes, beliefs, values, and social organizations of each alternative.

The sequence of analysis using these models was:

forest conditions or goals as discussed previously were used inconjunction with inventory data and maps of each analysis area to build all reasonable management strategies for each analysis area. This included the large heterogeneous analysis areas and timber analysis areas discussed earlier. These strategies were then modeled in terms of their costs, outputs, effects, and benefits in a steady state FORPLAN model. (This is discussed in more detail later in this appendix and is documented in planning records.)

a full set of benchmarks and alternatives was formulted and analyzed using the steady state model. Prescriptions in this model included alternative sets of standards to meet legal minimums and coordination requirements. The prescriptions that were chosen by the linear programming model for each benchmark and alternative were listed by analysis area. Because the objective function for each benchmark and alternative was maximization of present net value, these management strategies including their standards for meeting minimum management requirements represent the cost efficient set necessary for resolving all planning problems identified from issues, concerns and opportunities. (Results of this analysis are documented in planning records.)

economic impact analysis was done for a selected set of these benchmarks and alternatives to identify the full range of economic impacts that would result.

the results of these first two analyses were reviewed by the Forest management team. Each District examined in detail the strategies selected in steady state to assure that the full range of management considerations were addressed on each analysis area and that each strategy was feasible for each analysis area.

the timber harvest scheduling model was constructed. Analysis was done to identify: the maximum volume of timber that could be produced under non-declining yield; the volume and flow that would result if this constraint was relaxed; and the volume and flow that would be produced if economic value was maximized under non-declining flow and with flow restrictions relaxed.

scheduling considerations from the timber scheduling model were combined with the management strategies identified for each analysis area in the steady state analysis. This information was then used by a team composed of the interdisciplinary team, District Ranger from each District and members of their staff. The result of this effort was a detailed set of prescriptions for each analysis area for the final model that attempted to coordinate development in each analysis area through time, including a schedule for construction of arterial and collector roads.

concurrent with this development of prescriptions for the final model, was a analysis of social impacts of three alternatives as documented in Appendix F. Results of this analysis were used as input for an examination of the prescriptions being developed for the final model to see if major social concerns were well represented in this set of prescriptions. In cases where they were not, existing prescriptions were modified if such modifications were minor. If modifications were not minor, new prescriptions were developed to keep the efficiency analysis done at steady state intact.

results of all analysis done to this point was then examined by the Forest management team. The result of this examination was direction as to the major goals and objectives for alternatives to be formulated and analyzed using the final FORPLAN model.

while this examination was being done and direction was being formulated, 17 benchmarks were analyzed using the final model. Results of these benchmarks were reviewed by the Forest management team as part of their basis for direction on alternatives. Also results of this benchmark analysis were shared with the public as were the prescriptions by analysis area for the final FORPLAN model.

subsequent to this, the interdisciplinary team began formulation and analysis of alternatives. While this was being done, a group representing local citizens, the Greater Yellowstone Coalition, and the Sierra Club reviewed all benchmark results, prescriptions, and the amenity benchmark in particular. This resulted in input in the form of slight modifications to some prescriptions selected in this benchmark.

preliminary results of alternatives including input from the combined group on the amenity benchmark were then reviewed by the Forest management team. Direction relative to the final formulation of alternatives based on the on the ground knowledge and expertise of the management team was then formulated and given to the interdisciplinary team.

following this direction, the interdisciplinary team formulated the final set of alternatives presented in this document and used the final FORPLAN model, the 2 input-output models, and results of social analysis to estimate the outputs and effects of all alternatives as presented.

All of the above constitute an overview of the major analysis criteria used in Forest Planning on the Shoshone. The following sections of this appendix provide greater detail on the data collected and used, analysis procedures, and results of analysis. As discussed earlier, the analysis criteria used combined results of analytical processes and judgements by the interdisciplinary team, Rangers and their staff, and the Forest management team. Judgements and decisions by these groups were needed to assure that all alternatives were implementable and that management strategies selected for each alternative met the intent of that alternative in a reasonable and supportable way.

INVENTORY DATA AND INFORMATION COLLECTION

Inventory and data collection, as required by NFMA regulation 36CFR219.12(d), primarily consisted of coordinating existing data. Most of these data were assembled and stored in a planning data base called LMPLAN for ready retrieval and use in the planning process. LMPLAN is the Shoshone National Forest planning data base and is in a data base management sytem called System 2000 - a product in INTEL Systems Corporation.

The "Shoshone National Forest System 2000 Planning Data Base Dictionary," a part of the planning records, describes in detail the data and inventory information that is stored in the LMPLAN data base. Planning Action II (Planning Criteria for the Forest Plan) describes the process used to create LMPLAN. LMPLAN stores site specific data for areas of land on the Shoshone National Forest. These areas of land were delineated on maps - the delineation was based on a combination of geographic areas and ecological units. The geographic delineators included lines such as the Forest boundary, county lines, Human Resource Unit boundaries, Ranger Districts, fourth order watershed drainage boundaries, wilderness boundaries, roadless areas, game refuges, range allotments, and research natural areas. Ecological delineators include soil/land form units derived from soil survey information and potential natural vegetation types. This combination of delineators identified land areas on the Forest that are basic capability areas. These basic capability areas were further subdivided into sites which determine short term scheduling and resource capability. Sites were the smallest areas mapped and were based on timber stands, range types, recreation sites, administrative sites, occupancy special uses, and areas being (or to be) mined. In general, sites were ten acres or larger. A more detailed description of the mapping process is in the planning criteria (Planning Action II) of the planning records.

As planning problems were formalized, additions to data stored in LMPLAN were identified. These included such items as areas meeting criteria for high quality riparian areas, areas for potential sage and aspen treatment to improve wildlife habitat, and crucial preferred winter range for wildlife. These inventories were completed jointly by specialists on the interdisciplinary planning team, District personnel, and at times personnel from agencies such as the Wyoming State Game and Fish Department. This data was most often stored on map overlays and is available for viewing as part of planning records.

All of the above data and maps were used to identify pertinent characteristics of analysis areas. The Forest was subdivided into 2 kinds of analysis areas. The first type of analysis area included all nontentatively suitable timber land on the Forest. Each of these 109 analysis areas are contiguous areas on the Forest and range in size from 10,000 acres to over 50,000 acres. Boundaries for these areas were based on such factors as major wildlife herd units, administrative boundaries, and transportation network possibilities. Characteristics of each area were tabulated using data from LMPLAN and all other pertinent map overlays. This included tabulating and mapping all tentatively suitable timberland within each analysis area boundary. This tabulated data is available in planning records.

The second type of analysis area used dealt exclusively with tentatively suitable timberland. Tentatively suitable timberland was broken into analysis areas based on current species, age class, landform, slope, ecological habitat type, and geographic area. Landform, ecological habitat type, slope, and broad geographic area were combined as one identifier referred to as a timber repeating group. (A detailed discussion of timber repeating groups is included in Planning Action II and IV documents and in planning records.) The combination of factors used to delineate timber repeating groups were selected in such a way that each was internally homogeneous in terms of potential species, productivity and response to silvicultural treatments. All such timber analysis areas were mapped on overlays.

Production coefficients for timber were based on species, age class, stand condition, and repeating group. Two estimation models (R2-GROW and RMYIELD) were used to calculate potential yields given a specific set of treatments over the life of a stand. Range production coefficients were developed using range score cards. For this, the rangeland was mapped within each analysis area and tabulated by range type, land type and habitat type. Production coefficients from score cards were then determined for each combination of range type, landform, habitat type and range management system (e.g. open season long, deferred rotation, rest rotation). Forage production for wildlife was determined in the same manner as production for domestic livestock. Production coefficients for water were based on landform, soil type, habitat type and planned practices. Recreation use estimates for each management strategy for each area were based on the relative attractiveness of the area, recreation opportunities provided by that management strategy, planned road and trail network, recreation facilities, and past use of similar areas currently managed under a similar management strategy.

All lands shown on current inventories and cover maps were examined for suitability for timber production. Those lands not capable of growing commercial stands of trees, lands where access was impossible, lands where there was insufficient information available, and lands administratively withdrawn were identified by the Forest silviculturalist, interdisciplinary planning team and District timber specialists. Existing data on landform, habitat type, climate, soil type, cover type, stand condition and ortho-photo maps were used to make this determination. All other timberlands were classified as tentatively suitable.

Rangelands suitable for grazing domestic livestock were identified using past range analysis from allotment folders. These rangelands were classified as primary and secondary range; and the secondary range was further broken down into lands that with improvements could become primary range and lands where topography and slopes precluded conversion of secondary to primary range. Maps and data on landform, habitat type and slope were used in this determination. The determination was done by the interdisciplinary team and range specialists from Districts.

Cover type, habitat type, landform, and spatial location data were used by the interdisciplinary team and District personnel to identify areas where sage brush and aspen could be treated to improve range, wildlife and visual resources.

Landform, slopes, soil types and habitat types as mapped and entered into LMPLAN were used to determine areas within each analysis area where surface occupancy for oil and gas operations would pose a slight, moderate and high hazard to soil and water resources. The total acreage of each of these catagories of land was tabulated and mapped for each analysis area.

The same data was used to identify areas suitable for road and trail construction and construction of facilities.

The "Shoshone National Forest System 2000 Planning Data Base Dictionary" includes a description of all data, an estimate of mapping accuracy, and a judgement about the reliability of the resource inventory that is the source of the data. Planning Action II identifies the sources of data used in the analysis and the following paragraphs summarize sources of existing data that were used.

Social resource data were obtained by Human Resource Unit using procedures developed by the Foundation for Urban and Neighborhood Development (FUND).

Cultural resource data were obtained from current Forest files and a Forest cultural resource overview report prepared under contract specifically for the Forest Plan.

Information about the existing facilities on the Forest came from the Forest inventory of existing road systems, bridges and culverts. The inventory was stored in a System 2000 data base called Transportation Information System (TIS-2). Trail system information came from the Recreation Information Management inventory (RIM) and road jurisdiction came from the Right-of-Way Status Atlas maintained by the Forest. The inventory of buildings, dams and other improvements came from existing inventories of property.
Information on land ownership and status came from the land status records that are maintained by the Forest, special use case files, unauthorized occupancy case files, and from the land adjustment plan which identified areas suitable or unsuitable for acquisition or disposal.

Information on mineral resources came from case files on operating plans, permits, leases and licenses for energy, nonenergy and saleable minerals. To determine where active producing mines and known reserves are located, the Forest planning team reviewed present known activity, information from the US Geological Survey, US Bureau of Mines, private industry sources and published literature. These information sources were reviewed by the Regional Geologist who prepared a minerals overview and a series of maps illustrating potential for minerals occurrence.

Range resource data were primarily range types from the last complete range type inventory. Other inventory information came from allotment managment plans, allotment case folders, and experience of range conservationists working on the Forest.

Recreation data were from the recreation use information stored in RIM and from a special inventory of the Recreation Opportunity Spectrum done specifically for the Forest Plan.

Soil resource information came from soil surveys.

Sources of data for the tree resource were the Stage I and Stage II inventories, cover type maps and ortho-photos. All Stage II data were stored in a data base called Timber Management Information System (TMIS) which was used as the basis for timber-related data entered in LMPLAN.

The visual resource data came primarily from an inventory of visual quality, variety class and sensitivity levels done specifically for the Forest Plan by the Forest Plan by the Forest Landscape architect and District staff.

The watershed information came from watersheds delineated on topographic maps by the Forest hydrologist; estimates of water yield and water yield potential were calculated using a model called HYSED; stream order maps were used to determine drainage density; sediment discharge data came from USGS surveys; and precipitation data came from published climate records. Miles of stream type and riparian areas were calculated from topographic maps. Water quality data came from the National Storage and Retrieval Program (STORET) maintained by EPA.

Two new inventories were completed by the Forest hydrologist with aid from District personnel. The first of these was an inventory of areas suitable for enhancing summer run-off and for increasing water production. This included areas suitable for snow-fencing and areas where manipulation of timber stands could have a beneficial hydrological effect. The second inventory was a danger of destroying riparian habitat if over-used by domestic livestock and/or recreationalists. Criteria used for delineating all of these areas is in planning records as are the resulting map overlays.

Wildlife and fishery information came primarily from existing sources including published literature, special surveys of habitats and populations conducted either by the Forest Service of the Wyoming Game and Fish Department, and experience of Forest Service and State of Wyoming Game and Fish biologists.

ANALYSIS PROCESS

This section discusses in detail all analysis done prior to formulation of alternatives. This includes the delineation of analysis areas, development of prescriptions, procedures used to estimate coefficients in FORPLAN models, benchmark analysis, economic analysis and social analysis. Also, some facets of public involvement are discussed. Supporting documentation of this analysis process and intermediate results are included in planning records.

FORPLAN ANALYSIS

As discussed earlier, the analysis for Forest Planning centered on use of 3 linear programming models developed using version 2 of FORPLAN. Basic land delineations, cost estimates of practices, output and effect estimates, and benefit values did not vary from model to model. Thus only a single discussion of these items is necessary. All other discussions are presented by model.

Steady State Analysis

The first FORPLAN analysis done involved use of a steady state FORPLAN model. The conceptual basis for this model stems from the assumption that production of goods and services from a forest is a function of forest conditions. A forest condition is defined by the type, condition, and juxtaposition of vegetation and unchanging features such as topography, soil types, and availability of water. Each forest condition possible within an ecosystem is designed so that it can be achieved and once achieved maintained through time in a dynamic equilibrium state.

A simple example is a forest condition classically refered to as a fully regulated forest. This condition is defined as one where there is an even distribution of age classes, stocking levels are controlled as are cover types, all stands are accessible and protection from insects, disease, and fire are provided. This condition can be achieved on a forest through carefully planned application of management practices. Further once achieved, it can be maintained through application of management practices. On any single stand, timber will grow to its rotation age, will be harvested and then regenerated; so for that stand, a forest condition is dynamic. But, because there is an even distribution of age classes, the number of acres in each age class will remain constant through time as younger classes move up to take the place of ones grown older. This means that for the area regulated, "state variables" such as total inventory volume, acres by age class, and volume produced by harvests necessary to maintain desired stocking and age class distributions are constant from time period to time period. Thus the term "dynamic equilibrium" or steady state.

This concept appears to be included in the NFMA implementing regulations (36CFR219.3) in the form of the definition of a Goal: "A concise statement that describes a desired condition to be achieved sometime in the future."

As discussed earlier, 55 such forest conditions or goals were defined on the Shoshone based on issues, concerns and opportunities. Following is a summary listing of those goals:

Goals for Forested Ecosystems

GOAL	I.1	Sawtimber/motorized recreation/wildlife
	I.2	Roundwood/wildlife/motorized recreation
	I.3	Christmas trees/wildlife/motorized recreation
	I.4	Sawtimber/grazing/motorized recreation
	I.5	Water yield/sawtimber/motorized recreation
	I.6	Water yield/motorized recreation - unsuited timberland
	I.7	Grizzly bear/nonmotorized recreation/sawtimber
	I.8	Regulated oldgrowth/wildlife/recreation/sawtimber
	I.9	Unregulated oldgrowth/water quality/wildlife
	I.10	Wildlife/recreation/aspen
	I.11	Dear and elk winter range/recreation/forest products
	I.12	Cattle/motorized recreation/forest products - "Permanent Transition Range"

Goals for Range Ecosystems

GOAL	II.1	Cattle/motorized recreation
	II.2	Sheep/nonmotorized recreation - alpine
	II.3	Sheep/motorized recreation - alpine
	II.4	Sheep/motorized recreation - nonalpine
	II.5	Water yield/wildlife/nonmotorized recreation - alpine
	II.6	Nonmotorized recreation/grizzly bear/cattle
	II.7	Motorized recreation/cattle/wildlife
	II.8	Elk and deer winter range/recreation
	II.9	Bighorn sheep winter range/non-motorized recreation
	II.10	Wildlife/recreation - sagebrush
	II.11	Transportation livestock/recreation

Goals for Riparian and Aquatic Ecosystems

GOAL	III.1	High quality riparian/water quality/nonmotorized recreation
	III.2	Moose/motorized recreation/riparian
	III.3	Water storage and transmission/fisheries
	III.4	Reservoirs/motorized recreation/wildlife and fish

Goals for General Recreation

GOAL	IV.1	Primitive Recreation/water quality/grizzly bear/wildlife/fish
	IV.2	Semi-primitive nonmotorized recreation/wildlife
	IV.3	Semi-primitive motorized recreation/wildlife
	IV.4	Roaded natural recreation/wildlife
	IV.5	Rural recreation/visuals/wildlife - major travel routes
	IV.6	Public and private developed recreation - existing and NFRS sites
	IV.7	Skiing/water yield/developed recreation - inventories ski areas
	IV.8	ORV use

Goals for Wilderness Management

GOAL	V.1	Pristine/grizzly bear/water quality/wildlife and fish
	V.2	Primitive/grizzly bear/wildlife and fish
	V.3	Semi-primitive/designated camps/wildlife and fish
	V.4	Semi-primitive/domestic livestock
	V.5	Semi-primitive/transportation livestock
	V.6	Semi-primitive/day use

Goals for Minerals Development

GOAL	VI.1	Leasable minerals
	VI.2	Locatable minerals
	VI.3	Common variety minerals

Goals for Unique Management Situation

GOAL	VII.1	Wild River - recommended or inventoried rivers
	VII.2	Scenic River - recommended or inventoried rivers
	VII.3	Recreation River - recommended or inventoried rivers
	VII.4	Research Natural Areas - inventoried areas
	VII.5	Unique wildlife habitats
	VII.6	Grizzly bear enhancement - situation 1
	VII.7	Municipal supply watersheds
	VII.8	Rocky Mountain goat habitat

Goals for Facilities Management

GOAL	VIII.1	FA&O/VIS/communication sites
	VIII.2	Utility row corridors
	VIII.3	Other government special use facilities

Goals for Minimum Level Management

GOAL	IX.1	Protect Investments
	IX.2	Protect health and safety, soil and water, adjacent lands - minimum level management

These goals were used to help define the set of inventory data necessary for Forest Planning. They were also used to guide development of prescriptions for the steady state model. A discussion of analysis areas is necessary before a discussion of prescription development however.

Steady State Analysis Areas. Two types of analysis areas were used in the steady state model. These capitalized on the unique features of V2 FORPLAN.

The first type of analysis area were large, contiguous areas comprising 10,000 to 50,000 acres. A map showing the boundaries of these areas is in Appendix J of the Proposed Plan. These boundaries were selected because they fit closely with the way the Forest is managed. They often conformed to allotment boundaries which provided the ability to capture in the model different range management strategies and management systems. Also, these areas included winter ranges for one or more herd units of deer, elk, moose, and bighorn sheep providing the ability to deal directly with needs of these species. They were also large enough to capture within each analysis area, considerations of vegetative diversity to deal with habitat for viable populations of most other species of wildlife. From a recreation and visuals standpoint, each analysis area was large enough to capture the relative attractiveness of an area and the opportunities provided within that area . For a majority of these analysis areas, each captured major considerations for road and trail networks. Beyond this, these analysis areas provided the capability for dealing with soil and water impacts using yield coefficients developed specifically for that area and on the practices planned within that area. Further, these analysis areas provided a way to deal with possible oil and gas exploration and development in a reasonable way.

The second type of analysis area used in steady state analysis were refered to as timber repeating groups. Each repeating group represented features which were important in terms of silvicultural systems which could be applied, productivity, and timber types that are possible (e.g. some sites can only grow lodgepole pine, while on others both lodgepole and Douglas Fir are possible). They were delineated using data on such items as landform, soil type and habitat type. Each was assumed to be internally homogeneous in response to management. A total of 18 such repeating groups were delineated. Complete documentation of the delineation criteria and use of these repeating groups is included in "Planning Action 2" and planning records. These repeating groups encompassed all tentatively suitable timberland.

Prescriptions in Steady State Analysis. To match the two kinds of analysis areas used in the steady state model, two kinds of prescriptions were developed.

Development of prescriptions for the contiguous analysis areas began by tabulating inventory data for each analysis area. This data including map overlays was then examined to identify the set of forest conditions (goals) that could be achieved on each area. As discussed, each goal included an identification of the land type on which it could be achieved and maintained.

Each goal represents a complete description of a forest condition by type of land. Management of a forest, though, is done by area (e.g. drainage, allotment, etc.). In each analysis area, there may be many types of land. In this case, the juxtaposition of land types and management of neighboring land types is as important for estimating costs and production levels as the condition of each land type. To take these effects on costs and production into account, prescriptions written for the large contiguous analysis areas represented practices necessary for achieving a specific combination of goals. Each prescription provides for management of every land type within an analysis area except the tentatively suitable timberland. However, the type of management for tentatively suitable timberland that would be compatible with a specific prescription was noted within that prescription.

For example, one analysis area may have:

1200 acres of tentatively suitable timber land scattered in 100 to 200 acre patches
2500 acres of suitable range land
3/4 miles of high quality riparian areas
800 acres of not capable timberland
4000 acres of unsuitable range land
1400 acres of crucial preferred elk winter range

A combination of goals for this area could be:

Land Type	Goal
Tentatively suitable timberland	I.1 - Timber/wildlife/motorized rec.
Suitable range	II.7 - Motorized rec./wildlife/cattle
High quality riparian	III.2 - Moose/motorized rec./riparian
Not capable timberland	I.9 - Unreg. oldgrowth/wildlife/water
Unsuitable range	IV.4 - Motorized recreation
Crucial preferred winter range	II.8 - Elk winter range/recreation

A mix of goals such as this portrays a general management intent for an area, however there may be a variety of ways such of achieving and maintaining this mix of goals. Each way requires a specific set of practices and a specific set of standards and guidelines for implementation of those practices. The costs, goods and services produced, environmental effects and economic benefits produced are dependent on the spatial arrangement of goals, the practices used to maintain them and the planned set of standards and guidelines.

Prescriptions were developed for every reasonable combination of goals for each analysis area. (An unreasonable mix would be to manage the unsuitable range land for motorized recreation while the other lands scattered around it were being managed for non-motorized recreation.) Each of these prescriptions had a specific set of practices and standards built into it. Each prescription is a carefully designed "mini-plan" representing coordinated multiple-use management of an analysis area. Design of each was done to capture the most efficient mix of practices that if implemented together would produce the desired mix of goals.

Standards were included within each prescription to meet minimum management requirements and coordination requirements of 36 CFR 219.27. Often a number of prescriptions were written for the same mix of goals on an analysis area. This was done when there were clearly alternative ways of accomplishing the same purpose. Creating such alternative prescriptions with varying practices and standards provided a mechanism for testing the cost efficieny of these multiple use mini-plans and identifying the set of standards which meets minimum management requirements and coordination requirements in the most cost efficient way.

From this discussion, it should be clear that each prescription was written for a specific analysis area. No prescription applied to more than one because the specifics in terms of practices and standards changed to match the specific conditions and spatial arrangement of land types within an analysis area. This provided the necessary detail for modeling and analysis. These prescriptions included practices and standards necessary for maintaining a specific mix of forest conditions for the all lands within an analysis area except the tentatively suitable timber land. Each of these prescriptions indentified the type of timber management that would be compatible with and/or enhance the intent of that prescription.

A separate set of prescriptions was developed for tentatively suitable timber land as represented by timber repeating groups. These prescriptions included practices and standards associated with timber management. Standards varied by prescription to achieve specific forest conditions. For example, standards in one prescription developed to enhance timing and flow of water called for clear cutting in 5 to 10 acre patches while standards for prescriptions developed to enhance visual and wildlife diversity called for cuts to be oval in shape and approximately 30 acres in size. Rotations and management regimes modeled included all that appeared viable based on growth and yield estimates from timber growth models. If no commercial volume was produced at a specific rotation age or management regime calling for frequent commercial thins, then this strategy for timber management was not included in FORPLAN prescriptions. Rotations modeled included ages less than culmination of mean annual increment to ages far beyond culmination of mean annual increment. This normally meant a range of rotation ages from 70 or 80 years old to 180 or 200 years old with culmination of mean annual increment being 110 to 130 years old. Thinning regimes varied by prescription from none to as many as 6 entries. Prescriptions were written for each timber repeating group to include management of all timber types possible on a repeating group. Details of the full range of prescriptions developed are included in documentation of the steady state model in planning records.

Steady State Analysis. Analysis using the steady state model included running a full set of benchmarks and preliminary alternatives. Also, the timber portion of the model was run separately a number of times to answer questions concerning the relative effects of different management regimes and timber types for each repeating group. The purposes of this analysis included:

identification of prescriptions that resolved problems in a cost efficient manner. This was accomplished by running a full set of benchmarks and preliminary alternatives. Each benchmark was run to investigate the full range of production possibilities (e.g how much forage can be provided for domestic livestock if all range were in good condition with steady trend). The final objective function for each benchmark and preliminary alternative was maximization of present net value. Thus the prescriptions selected for each analysis area represented the ones which met the intent of that benchmark in the most cost efficient manner.

as stated earlier, each prescription included standards necessary for meeting minimum management requirements, legal minimums and coordination requirements. Because there were alternative prescriptions written to achieve the same purposes, but achieving those purposes using different sets of standards, this analysis helped to test the cost efficiency of standards needed to meet all requirements. In other words, if two prescriptions achieved the same purpose under different standards, the one selected using an objective function of maximization of present net value would be the most cost efficient; thus the standards included in that prescription would be the most cost efficient set of standards for that analysis area for those purposes. Testing standards in this way varied from the normal procedure of using right hand side constraints on the FORPLAN model to represent such standards. This procedure focussed on specific standards necessary given the characteristics of a specific analysis area and management intent. In this way, it provided a mechanism for more detailed analysis of standards to identify the most cost efficient than more conventional forestwide analysis of standards would have. A drawback of this, though, was that the "trade-offs" for each set of standards that are easy to track when they are represented as constraints were buried in the calculations done by the linear programming model and are impossible to display without an inordinate amount of prescription by prescription anaysis. Further because these standards were based on the specifics of a particular analysis area and management intent, the cost efficient set varied greatly from analysis area to analysis area. Display of these would have to be done on an analysis area by analysis area basis by management intent; something that if done would provide little more information than looking at the raw data input to build the FORPLAN model.

analysis of timber regimes and potential timber types was done. The purpose of this was to identify those regimes that would maximize volume or would maximize economic efficiency for each repeating group. This included an identification of the "best" timber type for each repeating group from a volume and from an economic efficiency analysis standpoint. This analysis provided a mechanism for testing the relative merits of harvesting before, at and after culmination of mean annual increment.

another purpose planned for analysis of timber in the steady state was to sort through all possible regimes to select those few necessary for the next 2 FORPLAN models. These models include solution of timber harvest scheduling questions. Such models can become very large and costly. It was thought that one way to allow for detailed investigation of management of existing timber while keeping model size to something manageable, would be to restrict the number of options for regenerated timber (i.e. restrict the regimes for timber to be managed after existing stands have been harvested.) Steady state analysis identifies those regimes that are superior from a volume and economic standpoint. Those regimes should be the target strategies if efficient management in the future is what is desired. Thus, by doing this analysis, it was thought that regimes identified at steady state would be the only options available for regenerated vegetation in subsequent models. Upon review of this procedure and its experimental nature, a decision was made to not use this analysis in this manner. This means that management regimes for regenerated vegetation were not restricted in subsequent models based on steady state analysis.

Those were the major purposes of steady state analysis. The results was an identification of the set of prescriptions for each large contiguous analysis area necessary for addressing issues, concerns and opportunities in a cost efficient manner. This included identification of the most cost efficient set of standards to meet minimum management requirements for each analysis area for each management intent. At steady state, typical analysis areas had 30 to 40 prescriptions developed for them. This process screened these to identify the necessary set to be passed on to the next steps of analysis. This often meant a reduction from 30 to 40 prescriptions to 6 to 12 prescriptions for an analysis area. Such a reduction provided the capability for those 6 to 12 to be developed in detail for subsequent analysis. If this screening had not been done, there would not be the detail that was developed nor would there be the assurance that the resulting set of prescriptions contained the most cost efficient mix of practices and standards necessary for resolving issues, concerns, and opportunities.

The full set of prescriptions developed and a listing of those that passed through this screening process are included in planning records. The Forest management team examined this set to see if they were indeed feasible on each analysis area and if they did resolve the full set of issues, concerns and opportunities before the prescriptions to be built for the third model were finalized. Further, this analysis provided a indication of the future forest conditions that will be achieved through management and the production levels of goods and services the Forest will be capable of in the future. This also was used as input to preliminary economic and social impact analysis.

Timber Harvest Scheduling Model

The second FORPLAN model used in analysis was a timber harvest scheduling model. The only portion of the Forest included in this model were tentatively suitable timber lands. This model was used to further address questions of harvest before culmination of mean annual increment; to identify optimum schedules for timber harvest unconstrained by other resource considerations including road networks; and after construction and use of the third FORPLAN model to test the effects of dispersion standards built into that model.

The conceptual background for this model was that of a conventional timber harvest scheduling model as used in previous timber management planning efforts.

Analysis Areas in the Timber Only Model. Analysis areas for this model were timber strata. The basic delineator for these strata were the repeating groups as used in the steady state model. These repeating groups were then subdivided based on the current condition of timber on these areas. This included age class, timber type, and condition of the overstory (under attack from insects and disease or not).

Prescriptions in the Timber Only Model. Prescriptions for this model represented timber management regimes and harvest schedule choices for each timber strata. Rotation ages modeled in steady state were also included in this model as were thinning options. All combinations of regimes for existing and regenerated vegetation were modeled including conversion of all age stands to even-aged stands and conversion of one timber type to another based on the types that could be grown on each repeating group.

Because no other resource considerations were included in this model, there were no standards included to meet minimum management requirements or coordination requirements. As in conventional timber harvest models there was no consideration of the spatial location of timber strata nor was there consideration of the dispersion of cuts and cut block sizes.

Practices included in this model were those associated with timber management only. In other words, practices associated with coordination with other resources were not included. Road construction considerations included only those local roads necessary to support timber management. No consideration of collector or arterial roads was included.

The only outputs and benefit values modeled were those associated with timber management; i.e. volumes of various products and their stumpage values.

Analysis Using the Timber Model. This model was used to accomplish a number of purposes. Included in these are:

> an analysis of harvesting before culmination of mean annual increment. Results of this analysis showed that in general, there was no advantage to harvesting before culmination from an economic nor a volume standpoint. The only time such harvest was selected was harvest one or two decades before culmination for a small portion of two age classes in order to meet flow constraints on timber production. This is mainly due to the age distribution of timber on the Forest.
>
> an analysis of departures from even flow. Relaxing flow constraints altogether resulted in a significant increase in harvest over the next 3 decades and then a cyclical pattern of very high harvests to almost no harvest. The high levels appeared to far exceed existing mill capacity and it did not seem appropriate to consider that such capacity would be built with the knowledge that in the next decade it would not be needed. Moderate deviations from non-declining flow showed no significant advantage either in volumes produced or in economic value.
>
> an analysis of schedules by timber strata which would maximize volume and schedules that would maximize economic value. This analysis was done to provide input for consideration of schedules for construction of arterial and collector roads in the third FORPLAN model. These linear programming runs were made, and their results tabulated by strata. These results were used by the teams building the final prescriptions for guidance as to the needs for access by decade.
>
> an analysis of the effect of dispersion standards. One of the requirements of the 1976 NFMA was a limit on the size of cut blocks for even-age management by timber type. For the timber types on the Forest, this was a maximum of 40 acres. When planning timber harvest in conjunction with consideration of other resources, other size and dispersion standards come into play. For harvests to benefit wildlife, a cut block of 30 acres, oval in shape and at least 600 feet from the next block is indicated by many research reports; for timber harvest to have maximum benefit for enhancement of water flow and timing, blocks of 5 to 10 acres are indicated. Such standards were built within timber prescriptions in the final FORPLAN model. This was done to assure that harvest schedules resulting from this model met legal minimums. It was also done to facilitate the development of multiple-use management strategies where timber management enhanced management of other resources within a large contiguous analysis area in conformance with the intent of the prescription written for that analysis area. A question was raised as to what the effect of these standards was on the volume and flow of timber. To test

this, comparable runs were made with this model and with the final FORPLAN model. Results from these runs showed that the volume produced by time period varied little because of such standards on dispersion. The major difference was the timber strata selected for harvest in each decade. Without such standards, harvests were concentrated in a few strata each decade. With such standards, harvests tended to occur in many more strata by decade. When these results were examined using map overlays of timber strata, those schedules resulting from the model with dispersion standards built in appeared more implementable.

As noted above, construction and use of this model provided needed information for construction of the final FORPLAN model. Also it provided a mechanism by which such questions as harvest before culmination of mean annual increment and dispersion standards could be addressed. These uses of this model aided assurance that the prescriptions, road construction schedules, and standards included in the final model were cost efficient and justified.

Final FORPLAN Model

This model was constructed based on results of the first two FORPLAN models. Like the steady state model, all lands on the Forest are included in this model. Like the timber only model, this model includes time periods out over the next 200 years and deals with solution to the timber harvest scheduling problem.

From a conceptual basis, there were many reasons for breaking analysis into these three models. The steady state model provided a relatively inexpensive tool for analyzing the full array of prescriptions possible to identify those that were superior in terms of their abilities to resolve issues, concerns and opportunities in a cost efficient manner. Because it was a "steady state" model, it required modeling of only one time period. This allowed for detailed development of prescriptions and focus was on maintaining forest conditions that were well defined. Costs for running the steady state model were 40 to 50 times less than costs of the final model; so much analysis was done for little expense. Part of this analysis was an analysis of standards necessary for meeting legal minimums and coordination requirements. Structuring presciptions as coordinated mini-plans for large contiguous areas allowed for direct modeling of these standards as needed given the set of practices and amount of management work included in a prescription. This plus the identification of the set of prescriptions necessary to address all issues, concerns and opportunities greatly simplified preparation of this final FORPLAN model and reduced the amount of analysis that had to be done using this relatively expensive and complex model. While steady state was used to screen prescriptions for the large contiguous analysis areas, it was decided by the Regional Office that this type of screening was too experimental for prescriptions dealing with timber. What was passed on to the final model, then, was the set of prescriptions for large, contiguous analysis areas which resolved issues, concerns and opportunities in a cost efficient manner; and the set of standards for each prescription that efficiently met legal minimums and coordination requirments of 36 CFR 219.27.

The timber only model was also relatively inexpensive to construct and use for analysis. It aided simplification of the final model in a number of ways. First was in terms of modeling timber with and without dispersion standards.

Doing both in a single model greatly enlarges the model and analysis costs. By building this model where dispersion standards were not included and comparing its results with those of the final model that included such standards, it was possible to test the effects of these standards in a straight forward and relatively inexpensive manner.

Another use was to test various rotation ages and to identify schedules for timber harvest that were optimal from a purely timber stand point. Analysis of harvest before culmination of mean annual increment (CMAI) indicated that there was no need for rotations that were significantly shorter than CMAI except where there were significant demands for roundwood. This reduced the number of rotation ages to be analyzed in the final model, which in turn simplified and reduced the potential size of the final model. An indication of the optimal schedules for timber provided a input to both the design of transpotation networks and the schedules for construction of these networks in the final model. This helped resolve a set of questions regarding the coordination of timber scheduling and construction of transportation networks. Further, this reduced the number of scheduling choices to be considered for such road construction which again simplified and reduced the size of the final FORPLAN model.

All of the above means that the set of prescriptions for each analysis area included in the final model were cost efficient, included the most cost efficient set of standards for meeting management purposes, and represented a full range of managment strategies. Further, the final model was more detailed, simpler and smaller than it would have been if it had been designed to do all analysis done in the previous two models. This meant that time and effort could be focused on building detailed prescriptions and using the full capabilities of V2 FORPLAN to address essential analysis questions.

Analysis Areas for the Final FORPLAN Model. Like the steady state model, two kinds of analysis areas were used in this model. The first were the large, contiguous analysis areas included in the steady state model. The boundaries of these areas were the same in both models so that the prescriptions selected in steady state analysis could be directly transfered into this model.

The second type of analysis area was timber analysis areas. These were delineated the same as the analysis areas in the timber only model, with one exception. In the timber only model, analysis areas were forestwide in nature; e.g. wherever there was a stand of 120 year old lodgepole pine on repeating group 5 it was part of the same forestwide analysis area as every other stand that met this criteria. In the final FORPLAN model, timber analysis areas from the timber only model were subdivided to account for the number of acres of a specific analysis area within the boundaries of one of the large, contiguous analysis areas. For example, Bald Ridge is one of the large contiguous analysis areas. Its boundary remained constant in both the steady state and the final FORPLAN model. Within the boundaries of that area are 300 acres of lodgepole pine 120 years old on repeating group 5. Those acres of repeating group 5 had been included as part of a forestwide timber analysis area in the steady state model and the 300 acres of lodgepole pine had been included in the timber only model as part of the forestwide analysis area described as lodgepole pine, 120 years old, repeating group 5. In the final model, these 300 acres became a separate analysis area from all other 120 year old lodgepole on repeating group 5 because they were located in Bald Ridge and not some other area.

Basic analysis area definitions and delineations were kept constant through all three models so that direct comparisons between the results of analysis using them could be made. This also meant that yield coefficients, cost estimates, and benefit values could be held constant between models. Further it meant that the results such as the most cost efficient set of standards identified in one model was transportable to the next.

Prescritions used in the Final FORPLAN Model. Like analysis areas, prescriptions in the final model were based on those used in the first two models. Also, like analysis areas, there were two kinds of prescriptions developed: multiple-use mini-plans for the large contiguous analysis areas; and timber harvest scheduling prescriptions for timber analysis areas.

Prescriptions for the large contiguous analysis areas were based on the prescriptions that emerged from steady state analysis. This set of prescriptions was examined by the interdisciplinary team and the Forest management team to assure that they were all feasible and that the set of prescriptions for each analysis area represented a full range of management options. Following this examination, each Ranger and his staff worked with the interdisciplinary team to develop these prescriptions in detail. The steady state prescriptions were developed to maintain specific mixes of goals on each analysis area. The prescriptions in the final model began with the existing forest conditions and selected and scheduled practices to alter current conditions to those maintained in steady state. The set of standards and coordination requirements for each prescription selected in steady state analysis were passed on to the associated prescription for this model. Based on steady state analysis and the on-the-ground expertise of District personnel, cost efficiency in terms of well coordinated application of practices and necessary standards was designed into each prescription.

Prescriptions designed for the timber analysis areas were basically the same as those for the timber only model with two exceptions. First was a development of management emphasis; e.g. was harvesting to be done to produce timber and enhance wildlife habitat , to produce timber and enhance visual quality along major travel ways, to produce timber under minimum standards, or to produce timber while enhancing water production and timing. Secondly, a set of standards including standards on the size of cut block and their minimum spacing was assigned to each management emphasis. A full set of timing options, harvest methods, and management emphases were developed for each timber analysis area.

As prescriptions for the large contiguous analysis areas were being developed in detail, each Ranger identified: which prescription reflected current direction on that analysis area as described in current plans and policies; and which prescription, if implemented, would solve the most pressing problems on that analysis area. These two prescriptions were given identifiers for the model of current direction prescription and Ranger's preference prescription. These identifiers were used to constrain the model for the current direction benchmark and alternative and for the Ranger's preference alternative. Other identifiers included: an identifier for prescriptions that emphasized such things as high quality water, low density recreation, and high emphasis on wildlife habitat; an identifier for prescriptions that went beyond the provisions of the Grizzly Bear guidelines to enhance recovery of the bear; and an identifier for prescriptions where the planned level of activities would result in meeting only minimum standards for protection of soil and water productivity. All of these identifiers were useful in analysis of benchmarks and preliminary analysis of alternatives.

Timber was modeled separately from other resources in this model to capitalize on the features of V2 FORPLAN that would efficiently create necessary timing options for solution of the scheduling problem. This minimized data input but provided a problem of how to coordinate managment of timber within a large contiguous analysis area with management of the other resources. To solve this problem, a linkage mechanism was developed. This required linking management emphases for all of the timber within the boundaries of one of the large contiguous analysis area to prescriptions for that area. Through this link, timber management emphases that were compatible with and contributed to the intent of a prescription developed for the large analysis area were tied together. This was done in a way that "forced" those emphases to be selected if that prescription for large analysis area were selected and vice-versa. This assured that management of all resources including timber was done in a coordinated way to meet the intent of management and solve problems efficiently. (Details of how this was done are available in Planning Records.)

Display of Prescriptions. For each analysis area, a set of FORPLAN prescriptions unique to that area was developed. Each FORPLAN prescription was a mini-plan for a specific analysis area that specified what practices, costs and standards would be applied and the schedule for applying those practices. The practices, standards for application of those practices and the schedule were designed to achieve and then maintain a specific mix of forest conditions (goals) for that analysis area. This allowed for accurate estimation and inclusion in FORPLAN costs, production levels of goods and services, benefits and environmental effects.

Each Forplan prescription, then, was very detailed. Attempting to display all of this detail in an easily understandable manner posed a problem. Such a display is necessary to show the overall intent of management by alternative and the set of standards governing application of practices. To develop a method for displaying management intent and standards, each FORPLAN prescription was examined in terms of the set of goals it was designed to achieve. Through this examination, a pattern of management emphases emerged and each emphasis was listed (e.g. emphasize semi-primitive nonmotorized recreation or emphasize protection and enhancement of crucial wildlife habitat components). This list of emphases provided a basis for applying the Uniform Forest Management Prescriptions (UFMPs) developed by the Regional Office because each UFMP was designed as a single emphasis management prescription.

UFMPs contain two parts, a general emphasis statement and a set of standards for application of practices to meet the intent of that emphasis. To apply these to the Shoshone, the set of management emphases that emerged from FORPLAN prescriptions was compared to those represented in UFMPs. All emphases in FORPLAN prescriptions except management of the High Lakes Wilderness Study Area and the Dunoir Special Management Unit were represented in UFMPs. It was decided to use UFMPs tailored to the Shoshone to display the general intent of management and to display the standards and guidelines which control how activities are carried out.

Each analysis area was subdivided into Management Areas. For each Management Area there is a statement of management intent and a set of standards and guidelines to be applied in addition to the standards and guidelines applied Forest-wide.

The FORPLAN prescriptions and the direction for Management Areas were used in concert to estimate outputs and effects. The activities listed in the FORPLAN prescriptions cannot be used to predict outputs and effects without knowing what standards and guidelines the activities are carried out under (these standards and guidelines are found in Chapter III of the Plan). Likewise just knowing the standards and guidelines will not permit prediction of outputs and effects unless activities are selected and scheduled (activities selected and scheduled are found in the FORPLAN prescriptions).

Direction for all management areas presented in Chapter III of the Plan and are mapped both on the Plan map and on alternative maps in the EIS. To provide more detail than presented in direction for Management Areas, Appendix J of the Plan presents the intent of each FORPLAN prescription selected for the Plan and the major activities that are planned for the first 10 years under these prescriptions. This is presented by analysis area and a map of analysis areas accompanies Appendix J.

The major characteristics of FORPLAN prescriptions and direction for Management Areas and their application are presented in the following display.

ITEM	PURPOSE	APPLICATION	CHARACTERISTICS
FORPLAN PRESCRIPTIONS	ANALYSIS: FOR SELECTING MANAGEMENT STRATEGIES AND SCHEDULES	ANALYSIS AREAS	SPECIFIC PRACTICES, COSTS TO PRODUCE SPECIFIED GOALS OUTPUTS, EFFECTS AND BENEFITS USING SPECIFIC STANDARDS.
MANAGEMENT AREA DIRECTION	DISPLAY OF MANAGEMENT INTENT & STANDARDS	MANAGEMENT AREAS	MANAGEMENT EMPHASIS STATEMENT AND STANDARDS & GUIDELINES FOR ALL FORPLAN PRESCRIPTIONS IN WHICH SUCH EMPHASIS IS INCLUDED

The tie between FORPLAN prescriptions and Management Areas is illustrated by a comparison of the maps in the Plan. Two maps are shown: one shows the distribution of Management Areas to depict the overall management emphases forestwide; and the other map associated with Appendix J shows the boundaries of analysis areas for which FORPLAN prescriptions were developed and applied.

COEFFICIENTS

Before a discussion of the analysis done with this final model, a discussion of the coefficients, economic analysis procedures, costs, and benefit values is presented.

Given a specific FORPLAN prescription for a specific analysis area, procedures for estimating production levels of each good and service were identified or developed. Often, a specific model or technique was prescribed for an output/effect by regional direction. A listing of outputs and models where such models were prescribed is included next. These models were used following prescribed techniques. The output levels estimated by these models for every relevant RX/AA combination were then used in FORPLAN analysis.

OUTPUT	MODEL USED
Softwood timber Softwood sawtimber from thins Softwood roundwood Fuelwood Timber inventory	"R2GROW" was used for existing stands based on site index, age and species. "RMYIELD" was used for regenerated stands based on site index and proposed species.
Natural sediment Increased sediment Natural water production Increased water production	WET and WETSED were used to develop coefficients to estimate these outputs.
Enhanced summer run-off	Literature from Laramie Experiment Station
Cattle/horse AUMS Sheep/goat AUMS	Range scorecards broken out by range type, condition, type of livestock and management system.

Some outputs/effects modeled required nothing more than a careful accounting for each prescription analysis area combination. For example, to estimate the number of acres on an allotment of sage management for wildlife began with an identification of the number of acres of treatable sage in that allotment from inventories, and then a quick accounting of how many of those acres are treated in each prescription. Outputs/effects so estimated include:

Areas open to snowmobiles
Areas with restrictions on snowmobiles
Areas closed to snowmobiles
Areas open to ORVs
Areas with restrictions on ORVs
Areas closed to ORVs
Designated outfitter/guide camps
Grizzly Situation 1 areas

Grizzly Situation 2 areas
Grizzly Situation 3 areas
Grizzly Situation 4 areas
Enhanced grizzly habitat management
Crucial preferred elk/deer winter range
Crucial preferred bighorn sheep winter range
crucial preferred moose winter range
Rocky Mountain Goat winter range
Other T&E habitat
Unique wildlife habitat
Sage management for wildlife
Acres of aspen managment
Acres of old growth management
Sage management for domestic livestock
Acres of even age management
Acres of selection harvest
Acres of commercial thin
Areas managed for high quality riparian
Water storage sites
Noncommercial timber management to enhance run-off
Structural water run-off improvements
Special Use Fees
Electronic sites
Administrative sites
Research Natural Areas
Nonreserved acres
Acres of slight hazard to soil and water resources
Acres of moderate hazard to soil and water resources

The remaining outputs fall into three categories; oil and gas, outputs related to recreation use and those representing soil loss. For all three categories, techniques unique to the Shoshone National Forest were developed.

Exploration and development of oil and natural gas are emerging issues of great import on the Shoshone National Forest. Given current and projected impact of these issues on management of this forest, consideration of these activities appeared in order.

Estimating physical quantities of oil and gas prior to drilling a well is a difficult, if not impossible task. Rather than atempting such estimations, ouputs and dollar values are based the set of stipulations and recommended standards for those activities included in a prescription. This was based on a procedure developed by the Rocky Mountain Oil and Gas Association (RMOGA) and was modified by ID team to meet analysis requirements. For each management unit, the following was tabulated:

1. Acres of nonreserve land - acres of land with a managment unit that have not been withdrawn from oil and gas activities.

2. Acres of slight hazard hazard - acres of nonreserve land within a managment unit where surface oil and gas operations would pose a slight hazard to soil productivity and/or water quality (this is determined based on procedures required by the Regional Office).

3. Acres of moderate hazard - acres of nonreserve land within a managment unit where surface occupancy would pose a moderate hazard to soil productivity and/or water quality.

These three outputs are the physical outputs representing oil and gas exploration and development opportunities.

Total acres available, stipulations and recommended standards for application of those stipulations within a prescription are used to calculate a "willingness to pay" dollar value for oil and gas. In this case, the "willingness to pay" value is the per acre price individuals would be willing to pay for a lease. This value is based on such costs as lease fees, filing fees and historic lease bids sales on comparable areas neighboring the Forest. Dollar values are modified on a prescription by prescription basis to reflect changes in the operating standards that would be recommended under stipulations included in each prescription. These values were included in analysis on an experimental basis. They were not included in calculation of PNV for benchmarks and alternatives. However the results of each alternative in terms of these values are presented in Appendix D.

For the outputs of "natural erosion" and "increased erosion", a process based on a modified soil loss equation was used. This process used an inventory of "capability area types" (CATS"). CATS represent a combination of vegetative habitat types, soil types and land forms. Both natural erosion and increased erosion were estimated using a modified soil loss equation for each prescription/analysis area combination based on the practices proposed in that prescription and the CATS effected by those practices.

In order to provide FORPLAN with decision criteria based on PNV for choosing between management options for a particular area on the forest, it appeared that there was a need to estimate the recreation use that would result from that option being applied to a particular area and not just the capacity.

There are well documented ways for estimating recreation capacity, but this appeared to fall short of what was needed to do analysis for forest planning, particularly PNV analysis.

The estimation procedure used involved four steps:

1. Analysis area were mapped and an estimate was made as to which goals typified current management.
2. RIM data by district was then examined by district personnel and was apportioned to each of these areas by ROS class.
3. Based on the outcomes of 1 and 2 as well as use trends by district by time period, this data can be used as composites to estimate recreation use given a management option for each of these areas. This is done by identifying which of these "composites", in general, resembles a particular option for a particular area. Then using an assumption that all other things remain the same, it is estimated that recreation use under that option for that analysis area would be the same as that projected for the most comparable composite.

4. Step 3 gives estimates of use under the assumption that all things remain the same. Because they won't under various alternatives, a demand cut off was used by time period to value only that which will be consumed. Demand cutoffs were estimated for each Ranger District based on past recration use and past and projected populations of affected Human Resource Units. Population estimates were obtained from the State of Wyoming. In this way, the 'best buy' to meet a particular set of demands will result from the allocation/schedule solutions coming from FORPLAN.

This procedure was used to estimate recreation use by RVDs by ROS class broken out by wilderness and nonwilderness recreation. It was also used to estimate consumptive wildlife user days and fish user days. As directed by regional direction, it was estimated that there would be one nonconsumptive wildlife user day for every consumptive wildlife user day.

Wildlife user days and fish user days were estimated at the same time that RVDs of recreation were estimated. In this way, possible "double counting" of recreation use was avoided.

A procedure that linked visual quality objectives to management activities was developed to estimate the effects on visual quality. These are represented in the model by acres by VQO from preservation to modification.

In summary, planning problems based on issues, concerns and opportunities were used to identify outputs that should be estimated for each alternative in order to rank alternatives in terms of their responsiveness to the problems facing management of the Forest. Inspection of this list led to identification of outputs for which there were required estimation proceudres. Next, it was identified that some outputs required no procedure other than a careful accounting of the number of acres on which a particular practice, prescription, goal or set of standards was to be applied. Finally, techniques unique to the Forest were developed based on experiences of other forests and consultation with the regional office for estimating erosion, oil and gas values, recreation use and visual quality.

EFFICIENCY ANALYSIS

Economic analysis plays a major role in developing a Forest Plan. This includes both efficiency analysis and impact analysis. Cost efficiency analysis is the analysis prescribed in 36 CFR 219 to deal with efficiency questions. Cost efficiency analysis was done for all prescriptions, benchmarks and alternatives using FORPLAN models. Present net value (PNV) was the indicator used to measure cost efficiency.

Cost efficiency is a concept unique to Forest Planning. It is a combination of conventional economic efficiency analysis and cost effectiveness analysis. For cost efficiency, inputs in the form of practices included in prescriptions are assigned a cost. Assignments of costs were based on past experience of District personnel and staff in the Supervisor's office as to what it has cost to do each practice under various field conditions and standards. Costs were assigned to practices based on the standards included in a specific prescription and the characteristics of the analysis area for which that prescription was developed.

Benefit values assigned to the goods and services modeled in FORPLAN are another major part of cost efficiency analysis. As stated, over 70 catagories of goods and services were included in FORPLAN and most were assigned an economic benefit value. For market outputs of timber, range and developed recreation, data from past experiences on the Forest were used to assign a benefit value. This was done by Regional Office staff and the Economic Research Service of the Department of Agriculture using data gathered from the Forest. For non-market goods and services such as dispersed recreation by recreation opportunity spectrum classifications, hunting, fishing and water, a willingness to pay value calculated by the Washington Office using values from the 1985 RPA program. Calculation of willingness to pay type of values for oil and gas leases were done on the Forest using the procedures discussed earlier. These benefit values were represented in prescriptions based on how the practices and their standards in that prescription would effect production of each good or service on the analysis area for which the prescription was developed.

Cost efficiency analysis is done by asking FORPLAN to identify the prescription to be applied to each analysis area that will produce the mix of goods and services specified for a particular benchmark or alternative and to base that choice on the present net value of each prescription. Present net value is defined as the present value of benefits minus the present value of costs produced by a prescription when applied to an analysis area. This is done in FORPLAN by using an objective function that maximizes present net value subject to production of the mix of goods and services desired for a specific benchmark or alternative. Such mixes of goods and services are represented as constraints in FORPLAN. The only constraints used in analysis of benchmarks and alternatives were constraints reflecting desired production levels of goods and services; no constraints representing minimum management requirements or coordination requirements were necessary for analysis using the FORPLAN models developed on the Forest.

Cost efficiency analysis was done using a 4 percent discount rate. All costs and benefit values were in 1982 dollars. No real cost or benefit increases or decreases were used in analysis. All costs and benefits used in cost efficiency analysis were included in FORPLAN. The only cost not included was right-of-way acquisition costs. These were added by alternative based on the management strategies chosen for that alternative and the rights-of-way necessary for accomplishing those strategies.

Costs Used in Analysis

As stated, cost values were entered into FORPLAN based on the practices, standards for those practices, anticipated use levels, and the characteristics of the analysis area on which those practices are to be applied. Complete documentation of base cost values can be found in the Practices, Costs, and Outputs notebook in Planning Records. Following is a list of the cost catagories used in analysis:

- Cultural Resource Inventory, Protection and Enhancement
- Developed recreation facility and site construction and reconstruction
- Developed recreation facility and site management
- Management of permits for private developed recreation sites on Forest

- Management of permits for Ski areas on Forest
- Recreation use administration for dispersed non-wilderness primitive recreation.
- Recreation use administration for dispersed non-wilderness semi-primitive, non-motorized recreation
- Recreation use administration for dispersed nonwilderness semi-primitive motorized recreation
- Recreation use administration for dispersed non-wilderness roaded natural recreation
- Recreation use administration for dispersed non-wilderness rural recreation
- Recreation use administration for dispersed pristine wilderness recreation
- Recreation use administration for dispersed primitive wilderness recreation
- Recreation use administration for dispersed semi-primitive wilderness recreation
- Dispersed recreation facility construction and reconstruction
- Dispersed recreation facility management
- Trail construction
- Trail maintenance, recronstruction and operation
- Visual rehabilitation and enhancement
- Monitoring of Visual Resources
- Wildlife habitat monitoring
- Treatment of aspen for wildlife habitat improvement
- Treatment of sagebrush for wildlife habitat improvement
- Wildlife habitat structural improvement construction
- Wildlife habitat structural improvement maintenance
- Aquatic habitat improvement
- Aquatic habitat monitoring
- Threatened and endangered species habitat monitoring
- Threatened and endangered species habitat improvement
- Maintenance of threatened and endagered species improvements
- Non-structural range improvements
- Range water developments
- Range fence construction
- Range corral and related structures construction
- Range structural improvement maintenance - Forest share
- Range structural improvement maintenance - permittees share
- Range administration costs
- Timber Resource monitoring
- Reforestation
- Site preparation for timber management
- Timber stand improvement
- Timber sale preparation
- Timber sale administration
- Monitoring of water resources
- Minerals activity administration
- Lands administration
- Monitoring of soil resources
- Arterial road construction and reconstruction
- Collector road construction and reconstruction
- Local road construction and reconstruction
- Recreation travel way construction and reconstruction

- Local road construction and reconstruction
- Recreation travel way construction and reconstruction
- Bridge and major culvert construction and reconstruction
- Road obliteration
- Administrative site construction and reconstruction
- Maintenance of administrative sites
- Road maintenance by four maintenance levels
- Road system operation and management
- Fuels management
- Project planning, non-timber projects
- Project planning, timber projects
- Program management for recreation, wildlife, timber, range, air, water, soils, minerals, lands, special uses, fire, fish and threatened and endangered species
- General Administration
- Fire protection

All costs were entered into FORPLAN based on the practices and standards included in a prescription and the characteristics of the analysis area for which the prescription is developed. Thus the cost of any one practice varied greatly by prescription and analysis area. Guidelines for varying those costs are included in planning records. Full tabulation of costs by prescription/analysis area combination are available in FORPLAN input files in planning records.

Benefit Value Used in Analysis

Benefit values are used in analysis to reflect the value to society of producing alternative mixes of goods and services. For analysis, assignment of benefit values was based on the assumption that benefits are realized on site. For example, timber benefit values are stumpage values, not value of finished boards from a mill; range values are the value of forage as consumed on the Forest; and recreation values are based on estimates of consumption not on capacity for this provides a more realistic approximation of consumer preferences. In some benchmarks and alternatives, production of non-priced benefits of high visual quality and high quality water were used as constraints. These were the only non-priced benefits considered in analysis. No benefit values effecting cost efficiency analysis were considered outside of FORPLAN analysis. Following is a listing of benefit values used in analysis. All of these except forage values for domestic livestock are based on values in the 1985 RPA update as tailored for the Forest by the Regional office. Forage values for domestic livestock were estimated by the Economic Research Service based on data collected on the Forest. All values are adjusted to 1982 dollar values. Because of a lack of sufficient data on price trends, no price trends were used in analysis. Further the amount of a good or service that was valued in benchmarks and alternatives was limited to anticipated consumption levels. This was based on the assumption that only those production levels of goods and services that would be consumed have value; production in excess of that that would be consumed has no value .

RANGE

Total value of an AUM of cattle forage	$ 9.09
Total value of a Sheep month of forage	$ 1.82

DEVELOPED RECREATION

Total value of a Recreation Visitor Day (RVD) (This value was used whether the RVD was provided by the Forest Service or by a special use leasee.)	$ 9.97

DISPERSED NON-WILDERNESS RECREATION

Value of an RVD of Primitive Recreation	$ 10.31
Value of an RVD of Semi-Primitive Non-motorized Recreation	$ 13.84
Value of an RVD of Semi-Primitive Motorized Recreation	$ 12.69
Value of an RVD of Roaded Natural Recreation	$ 9.97
Value of an RVD of Rural Recreation	$ 9.19

DISPERSED WILDERNESS RECREATION

Value of an RVD of Pristine Recreation	$ 12.50
Value of an RVD of Primitive Recreation	$ 12.50
Value of an RVD of Semi-Primitive Recreation	$ 12.50

HUNTING AND FISHING DAYS

Hunting Day for Big Game Hunting	$ 41.00
Hunting Day for Small Game Hunting	$ 16.00
Hunting Day for Upland Bird Hunting	$ 24.00
Hunting Day for Waterfowl Hunting	$ 18.00
Wildlife User Day - Non-game use	$ 25.00
Fishing Day	$ 11.00

WATER

Value of an acre foot of water	$ 45.50

SPECIAL USE PERMITS

Value of an Oufitter & Guide Permit	$ 200.00 per year

Value of existing Special Uses including lodges and Ski areas based on past revenues to the Forest. These are entered separately by permit.

OIL AND GAS LEASE VALUE

A willingness to pay value for a lease of $174/acre of non-reserve land was used if few restrictions were recommended on exploration and development. As more restricitions were recommended within a prescription as needed to meet the intent of the prescription, this value was reduced. The above value was based on competitive lease bids on lands neighboring the Forest. This value was used on an experimental basis and was not used in calculation of PNV for alternatives. Effects of each alternative in terms of this value are displayed in Appendix D. Full documentation of its derivision and adjustments to it by prescription is located in Planning Records.

TIMBER

Englemann Spruce Sawtimber per 1000 cubic feet (MCF)	$ 222.21
Douglas Fir Sawtimber per MCF	$ 222.21
Lodgepole Pine Sawtimber per MCF	$ 266.63
Pole Timber and Fuelwood per MCF	$ 19.00

To be consistent in valueing all outputs, adjustments were made in the above stumpage values to reflect higher costs of logging under shelterwood and selection systems as well as higher costs associated with logging slopes greater than 40 percent.

ANALYSIS DONE USING THE FINAL FORPLAN MODEL

Analysis accomplished using the final FORPLAN model prior to development of alternatives is documented in "The Analysis of the Management Situation - Planning Action 4" and is available as part of Planning Records. This involved formulation of eighteen benchmarks inccluding preliminary alternatives to investigate the range of choice, the ability of the Forest to produce levels of goods and services as assigned by the Regional Guide, the probable effects of continueing current direction and the ability of the Forest to resolve issues concerns and opportunities. All of this analysis is summarized here.

Benchmark Analysis

To provide information on production potential and the effects of changing management emphasis for the Forest, eighteen benchmarks were formulated using the final FORPLAN model. Most benchmarks required few if any constraints other than timber flow constraints. Timber flow constraints varied from none (the maximum timber unconstrained), non-declining flow, and allowing flow to increase no more than 15 percent and decrease no more than 10 percent by decade (this latter flow constraint is refered to as the "standard flow constraint" for the remainder of the benchmark discussion).

Benchmark analysis was done to identify the latitude that management has in responding to issues and concerns and the effects of that response. In order to be comparable, all final benchmark runs using FORPLAN were done with an objective function of maximizing present net value. The PNV displayed for each benchmark includes all costs and benefit values included in FORPLAN as described earlier. All benchmarks provide for meeting coordination standards and legal minimums. Some violate Forest Service Policy in an attempt to show the effects of meeting policy requirements (the major policy requirement investigated was non-declining flow). The final FORPLAN model was used to formulate and analyze all benchmarks.

The benchmarks created include:

- Minimum level management
- Current direction
- Maximum PNV using market values only in the objective function
- Maximum PNV using market and assigned values in the objective function
- Maximum timber with the standard flow constraint
- Maximum forage production for domestic livestock
- Optimum recreation
- Maximum forage production on suitable range for wildlife
- Maximum water production
- Maximum management for recovery of the Grizzly Bear
- Maximum timber with non-declining flow constraint
- Maximum timber with no flow constraint
- Maximum PNV using market and assigned values and non-declining timber flow
- Maximum PNV using prescriptions chosen by Rangers to solve specific management problems on each analysis area
- Maximum PNV using market and assigned values and a budget constraint representing a 25 percent reduction in budget from F.Y. 1982 Budget
- Maximum production of amenity values
- Maximum production of forage for cattle
- Maximum wilderness

DESCRIPTION OF BENCHMARKS

All benchmarks included the same assumptions on projected consumption levels for goods and services. Because of the Forest's ability to produce excess amounts of recreation and forage for domestic sheep, these were the two areas where a cut-off was used on the amount of production valued in PNV calculations. As described earlier, minimum management requirements, coordination requirements and standards to meet soil and water minimums were included within prescriptions. There was no need to represent these in any of the benchmarks as constraints. As discussed, the set of standards included in the prescriptions for this model resulted from the cost efficiency analysis done using the steady state model. These proved to be the most cost efficient set of standards by prescription-analysis area combination based on that analysis. Because of this, further analysis of these standards necessary to meet legal minimums and coordination requirements did not appear to be necessary especially because of the way they were built directly into prescriptions. In the earlier discussion of these, it was indicated that detailed specification of standards were necessary for accurate estimate of costs, outputs, effects and benefits; for this reason they were included in prescriptions. Analysis done in this way provided for more detailed analysis of such standards than analysis of a set of right hand side constraints representing in general a set of standards.

Because all benchmarks were either not constrained or lightly constrained, there was no separate analysis of sets of constraints. Rather, the overall changes in production and economic value as reported in the benchmark tables is the measure of how production changed by constraints representing the intent of each benchmark.

MINIMUM LEVEL (BENCHMARK #1)

This benchmark represents the minimum level of management needed to maintain this Forest as part of the National Forest System. Costs are those associated with such management and focus on protecting the Forest from trespass and theft of materials and protecting incidental users and neighboring land owners. Outputs are those over which management has little or no control. They include incidental recreation use, wildlife habitat, and natural water production. Minimum level is a management strategy that would meet only the following statutory requirements: administration of unavoidable, nondiscretionary land uses; prevention of impairment of the productivity of the land; and protection of the lives, health, and safety of incidental users. The sum of the costs of these activities defines the long-term fixed costs of public ownership.

This benchmark provided a base for comparing incremental costs and benefits of those alternatives considered in detail. This ensured that economic parameters used in evaluating alternatives were the result of a true incremental analysis in which fixed benefits and costs were not a factor.

Creation of this benchmark was done by using an objective function to maximize PNV and constraining every analysis are to a minimum level management prescripton. No other constraints were used.

CURRENT LEVEL (BENCHMARK #2)

This benchmark level was designed to be the required no-action alternative (Alternative A). It specified the management actions most likely to be implemented and the outputs most likely to be realized if current direction were followed. It also represents a basis for comparison of alternatives in deciding what changes in current direction are needed to solve management problems.

Creation of this benchmark was done using an objective of maximizing PNV using both market and RPA assigned benefit values for outputs. Non-declining flow, which is the current policy, was included as a requirement and only those FORPLAN prescriptions representing current direction were considered. Timber outputs for the first decade were required to be at least 80 percent of the average annual output specified in the 1976 timber management plan. (The amount of timber produced in this benchmark was greater than this constraint. In other words this constraint was not binding and therefore had no effect on the solution). No other constraints were used.

MAXIMUM PRESENT NET VALUE - MARKET OUTPUTS (BENCHMARK #3)

This benchmark level was designed to maximize the present net value of only those goods and services with potential for monetary return to the U.S. Treasury. On this Forest, those goods and services include timber, livestock grazing and developed recreation. Values for all of these outputs were based on 1985 RPA values. Grazing values were based on a study by the Economic Research Service.

Creation of this benchmark was done using an objective of maximizing PNV using only benefit values for market products. No minimum amount of timber, recreation or AUM production was set. Timber flows were controlled so that they could not increase by more than 15 percent nor decrease by more than 10 percent by decade. No other constraints were used.

MAXIMUM PRESENT NET VALUE - MARKET AND NON-MARKET OUTPUTS (BENCHMARK #4)

Benchmark 4 was used as a standard to compare the present net values of all alternatives considered in detail. Differences in present net values between Benchmark 4 and alternatives considered in detail reflect the monetary opportunity costs associated with those alternatives' emphasis, goals and objectives.

Creation of this benchmark was done using an objective of maximizing PNV using market and assigned benefit values for all outputs. The standard timber flow was used. No minimum levels of production of goods and services were set as constraints. No other constraints were used.

MAXIMUM TIMBER WITH STANDARD FLOW CONSTRAINT (BENCHMARK #5)

This benchmark was designed to acheive two purposes. First it is a test of non-delining flow policy to see what the advantages of a reasonable departure from that policy may be. Second, because of the skewed age distribution of timber and current insect and disease problems, this benchmark investigates a way to solve some current timber management problems.

A dual objective function was used for this benchmark. First timber production was maximized for the first 50 years subjcet to the standard flow constraint. Then an objective function of max PNV using market and assigned values was used given that the maximum amount of timber calculated first had to be produced. No minimum levels of production of goods and services were set as constraints. Other than the standard flow constraints, there were no constraints on this benchmark.

MAXIMUM RANGE LEVEL (BENCHMARK #6)

This benchmark is derived from managment direction which would maximize production of livestock (cattle and sheep) forage subject to laws and regulations and without impairing the productivity of the land. This single resource emphasis is used to determine the actual biological potential of the Forest to produce livestock forage. The resulting schedule of forage levels over time is the maximum total amount that could be produced over the first five decades. All land area classified as capable, suitable, and available for livestock production was included in this analysis.

The maximum average annual resource capacity in thousands of AUM's that could be achieved from this benchmark in the fifth decade defines the upper bound for all alternatives considered in detail. This amount is used in conjunction with an objective of maximizing PNV using both market and assigned values. The standard timber flow requirement was also used.

A dual objective function was used for this benchmark. The first was to maximize the sum of cattle and domestic sheep AUMs for the first five decades. The resulting amount was then used as a contraint with an objective function of maximizing PNV using both market and assigned values. No minimum levels of production of goods and services were set as constraints. The only other constraint included in creation of this benchmark was the standard timber flow constraint.

OPTIMUM RECREATION (BENCHMARK #7)

This benchmark was designed to satisfy dispersed and developed recreation consumption levels both inside and outside wilderness, subject to laws and regulations and without impairing the long-term productivity of the land.

The maximum average annual expected use, in thousands of RVD's of developed and dispersed recreation, defines the upper bound for all alternatives considered in detail. This amount is used as a set of constraints in terms of expected use by Recreation Opportunity Spectrum Class (ROS). The objective function of the benchmark was to maximize PNV using market and assigned values. No minimum levels of production of goods and services were set as constraints. The standard timber flow constraints were the only other constraints used in this benchamrk.

MAXIMUM FORAGE PRODUCTION FOR WILDLIFE (BENCHMARK #8)

This benchmark level is derived from management direction which would maximize the capacity of the Forest to provide an optimum mix of wildlife species and diversity, subject to laws and regulations and without impairing the long-term productivity of the land. This resulted in a schedule of wildlife habitat improvement over time that is the maximum amount that could be accomplished over the first five decades.

This benchmark was created using dual objective functions; first was maximize wildlife forage for the first five decades; the maximize PNV using market and assigned values to identify the most cost efficient way to produce this maximum forage. No minimum levels of production of goods and services were set as constraints. The only other constraint was the standard timber flow constraint.

MAXIMUM WATER YIELD LEVEL (BENCHMARK #9)

This benchmark is derived from management direction which would maximize the capacity of the Forest to produce water, subject to laws and regulations and without impairing the productivity of the land. The resulting schedule of water yield is the maximum amount that could be produced in the next five decades without unacceptable degradation of water quality. Timber harvest, other vegetation treatment and structural snowpack management would all be used with the primary objective of increasing water yield and improving the timing of flows.

The two objectives were to maximize water production and then maximize PNV using market and assigned values. The standard timber flow requirement was also used. No minimum production levels of other goods and services were used as constraints.

MAXIMUM GRIZZLY BEAR LEVEL (BENCHMARK #10)

This benchmark is derived from management direction which would maximize grizzly bear habitat, subject to laws and regulations and without impairing the productivity of the land.

The Forest has a significant amount of habitat for grizzly bears, currently a threatened species in the greater Yellowstone ecosystem. This benchmark was created to investigate the Forest's maximum capability to aid in the recovery of this species and provide for a recovered population. This benchmark also provides information for assessing the opportunity costs of grizzly bear management.

The objective function used to create this benchmark was to maximize PNV using market and assigned benefit values. Constraints used were the standard timber flow constraint and a constraint to force into solution prescriptions designed to go beyond the grizzly bear Guidelines and enhance bear habitat as much as possible. No minimum production levels for other goods and services were used as constraints.

MAXIMUM TIMBER NONDECLINING FLOW (BENCHMARK #11)

This benchmark is identical to benchmark 5, except that harvest level cannot decrease from decade to decade. As part of analysis of the non-declining flow policy, this benchmark was needed for comparison with the maximum timber using the standard flow requirements (Benchmark 5) and the maximum timber benchmark without flow requirements (Benchmark 12). The results of all three runs provide information as to the need for a departure alternative on the Forest to deal with its skewed age distribution and insect and disease problems.

Two objective functions were used to create this benchmark: maximize timber for the first five decades and maximize PNV using market and assigned benefit values while producing that timber output. Nondeclining flow was the only constraint used. No minimum levels for other goods and services were used as constraints.

MAXIMUM TIMBER UNCONSTRAINED (BENCHMARK #12)

This benchmark is identical to benchmark 5, except that the harvest level can increase or decrease in unlimited amounts from decade to decade. This benchmark examines the maximum potential and long term effects of producing timber over the first five decades.

The objective functions for this run are to maximize timber for the first five decades and maximize PNV using market and assigned benefit values while producing that timber. No minimum production levels for goods and services were used as constraints. No other constraints were used.

MAXIMUM PRESENT NET VALUE - MARKET AND NON-MARKET OUTPUTS, NONDECLINING TIMBER FLOW (BENCHMARK #13)

This benchmark is identical to benchmark 4, except that timber harvest level cannot decrease from decade to decade and there is no minimum harvest level. The benchmark was created to investigate the best the Forest can do under current policies to maximize economic efficiency. Results of this can also aid determination of the opportunity cost of non-declining flow when compared with the results of the MAX PNV benchmark that used the standard timber flow requirements.

The objective function used to create this benchmark was to maximize PNV using market and assigned benefit values while maintaining a non-declining flow of timber. No minimim production levels for goods and services were used as constraints. No other constraints were used.

MAXIMUM PRESENT NET VALUE - DISTRICT RANGERS' CHOICE (BENCHMARK #14)

As prescriptions were developed, Rangers identified the FORPLAN prescriptions that appeared to solve the most management problems on each analysis area. This benchmark was designed to determine the forestwide effects of these FORPLAN prescriptions.

The objective function of this benchmark was to maximize PNV using market and assigned benefit values. Standard timber flow constraints and constraints forcing selection of designated prescriptions were the only constraints used. No minimum production levels for other goods and services were used as constraints.

MAXIMIZE PRESENT NET VALUE WITH A 25 PERCENT REDUCED BUDGET (BENCHMARK #15)

This benchmark is necessary to provide input for creating the "reduced budget" alternative that is analyzed in detail.

The objective function for this benchmark was to maximize PNV using market and assigned benefit values. The standard timber flow requirement was used along with a budget constraint representing a 25 percent reduction from the 1982 Forest actual budget. No minimum production levels for goods and services were used as constraints. No other constraints were used.

MAXIMIZE AMENITY VALUES (BENCHMARK #16)

From social analysis, it appeared that many of the local publics favored managing the Forest to maximize amenity values. This benchmark was designed to investigate the effects of such a management strategy.

The objective function for this benchmark was to maximize PNV using market and assigned benefit values. Only those prescriptions which significantly improved wildlife habitat and/or enhanced water quality were considered. No minimum production levels for goods and services were used as constraints. The standard timber flow constraint was the only other constraint used.

MAXIMUM FORAGE PRODUCTION FOR CATTLE (BENCHMARK #17)

Some allotments on the Forest can produce either cattle or sheep. In the face of declining demands for sheep, a benchmark that would identify the maximum amount of forage for cattle only was judged to be necessary.

Two objective functions were used; first maximum cattle forage and then maximum PNV with this forage used as a constraint. The standard timber flow requirement was the only other constraint used.

MAXIMUM WILDERNESS (BENCHMARK #18)

This benchmark was developed to evaluate the effects of designating all RARE II areas as wilderness. It was developed prior to the passage of the Wyoming Wilderness Act of 1984.

Creation of this benchmark was done using an objective function of maximizing PNV using market and assigned benefit values for all outputs. The standard timber flow requirement was used (see Benchmark 3).

SIGNIFICANT RELATIONSHIPS IN THE PRODUCTION OF MARKET AND NON-MARKET OUTPUTS

As illustrated in the summary table of benchmark results, there were no significant changes in production of goods and services between benchmark 3, which maximized PNV using market values and benchmark 4, which maximized PNV using both market and assigned values. The major difference is in the PNV as calculated. In benchmark 3, only market goods and services were valued; in benchmark 4 values for all goods and services were included in PNV calculations. This illustrates the fact that the Forest has a relatively low potential for producing commodities with its major values being wildlife, scenic beauty and recreation.

A number of points of interest are illustrated by this result. First, all prescriptions were designed carefully to produce a multile-use mix of goods and services in a cost efficient way. This was reinforced by analysis which screened out prescriptions which produced desired mixes of goods and services, but not in the most cost efficient way. The final set of prescriptions, then, represented a well balanced mix of coordinated management strategies, practices and standards and guidelines that accounted for the multiple-use nature of forest production. Secondly, the amount of land on which vegetation can be manipulated to produce commodity outputs is less than 20 percent of the total forest. Given this and the fact that most detrimental effects of oil and gas production can be mitigated in terms of production of other goods and services, production of commodities can be easily integrated with production of non-commodities. Thus prescriptions which call for intensive management of commodities also included intensive management and thus high production of non-commodities.

Significant effects between benchmarks were not between traditional commodities and non-commodities, but between the levels of development on the Forest. This is best illustrated by looking at the differences between benchmarks 8, 10, 11, 13, and 16. Timber and production of developed recreation varied somewhat between these benchmarks, but not a great deal. The major variance in outputs was over forage available for wildlife on suitable range lands and forage available for domestic livestock off of the same lands. The significant variance between these benchmarks is not in the level of development and the standards under which such development would occur. In benchmarks 8 and 16, the same amount of land would be available for oil and gas development and only about 10 percent less timberland is being managed to produce timber, but for each of these activities, the standards for operations are oriented to maintain or enhance if possible such goods and services as wildlife habitat, visual quality, and low density, high quality recreation. These standards, at times, increase the cost of operations not necessarily the amount of operations allowed or planned. This is reflected in a slightly lower PNV. Given the character of the Forest, these additional costs may not be significant in terms of over all effects in comparison with the social and economic impacts of managing the Forest for non-commodities.

Analysis of Constraints

Constraints on a linear programming model define the decision space in which optimization must occur. As such, they override all factors in the objective function and limit consideration of possibilities for solution. Because of this, analysis of constraints when using a linear programming model becomes important for identifying areas where a minor adjustment in constraints could greatly increase the achievement of the objective function.

Some typical classifications for constraints used in FORPLAN models include:

constraints to represent legal minimums and coordination requirements as specified in 36CFR219.27 - these are referred to as minimum management requirements.

constraints on timber flow to match the non-declining policy of the Forest Service.

constraints which define the objectives of an alternative - these are referred to as discretionary constraints.

Even though minimum management requirements were not represented as "right-hand-side" constraints in FORPLAN models used on the Shoshone, the following includes a discussion of the analysis of all three types of constraints. Two of the minimum management requirements modeled that is of particular interest to many is meeting the requirements of the "Grizzly Bear Guidelines" and dispersion standards for timber harvests. Because of this interest, these are discussed separatey from the other minimum management requirements.

Minimum Management Requirements. Minimum management requirements are standards on how, where and how much of an activity will be applied. They are used to assure that legal minimums on air, soil, water, threatened and endangered species and other wildlife are met. They are also used to meet coordination requirements as needed by the intent of a prescription for a specific analysis area. The set of standards applicable to an activity can change based on the intent of management and factors surrounding a specific application of an activity; e.g. standards for road construction to protect soil and water could vary by such factors as erosion hazard, proximaty to water courses, slope and what type of use the road is designed for.

Such standards greatly effect costs of operations, amount and types of goods and services produced and environmental effects produced. Production of goods and services from ecosystems is a function of forest conditions and the spatial arrangement of those conditions. Forest conditions, in turn, are a function of the management practices applied and the standards for applying those practices. In other words, practices applied using a specific set of standards creates a specific forest condition which in turn produces a multiple-use mix of goods and services. Without specifying a set of standards for those practices, there is no basis for accurate estimates of the forest conditions/goals that will result from application of those practices. Without estimates of the resulting forest conditions and their spatial arrangement, environmental effects can not be accurately estimated. Estimates of costs, environmental effects can not be accurately estimated. Estimates of costs, production levels, environmental effects, and economic benefits resulting from a proposed management strategy, then, can not be made without specifying standards for application of practices. This means that there is no real way to estimate costs, benefits and effects when trying to model prescriptions without standards of some sort assumed or built into them.

A more accurate way to test efficiency of minimum management requirements is to build standards into prescriptions and then to build alternative prescriptions to achieve the same purpose, each with its own set of standards. These can then be modeled and tested in a comparative way for cost efficiency.

This testing and analysis of minimum management requirements was done using the steady state model as discussed earlier. Alternative prescriptions were developed for each mix of forest conditions possible on an analysis area. The major difference between prescriptions designed to achieve the same mix of goals were the standards applied to practices to meet minimum management and coordination requirements. Analysis to identify the most cost efficient set of standards necessary for meeting the intent of management was done by running a complete set of benchmarks and preliminary alternatives. By using an objective function of maximizing present net value for each of these, FORPLAN chose the prescriptions that were the most cost efficient for achieving the intent of each benchmark and preliminary alternative. Each of these prescriptions included a set of standards necessary for meeting minimum management requirements. Thus these, by definition, are the most cost efficient set of standards necessary. The standards so identified at steady state were the ones built into prescriptions for the final FORPLAN model.

Standard analysis procedures are to represent minimum management requirements as right hand side constraints on the linear programming model. While this provides a very clean analytical approach and results that are easy to report, the difficulty of estimating costs, production levels, and environmental effects inherent in this approach leaves its results suspect. Analysis on the Shoshone attempted to avoid this pitfall by testing alternative sets of standards. Unfortunately, though this is a more detailed analysis focussing on the specifics of each prescription-analysis area combination, it does not lend itself to development of data on constraint analysis because there are no constraints to analyze from a linear programing standpoint. Rather, the differences between alternative sets of standards are represented by the differences in PNV of alternative prescriptions in the Steady State Forplan model. All prescriptions for this model and their economic properties are stored in Planning Records.

Standards necessary for meeting legal minimums and coordination requirements of 36 CFR 219.27 are included within each FORPLAN prescription. There was no need to represent these items as right hand side constraints for the model. Because they were not represented as constraints on the linear programming model, there was no way to do constraint analysis on them. Further, following Chief's analysis direction, such standards included within prescriptions are not considered constraints subject to constraint analysis. The full set of standards necessary for meeting legal minimums and coordination requirements are displayed in Management Area Direction in Chapter III of the Forest Plan. By providing for and requiring close coordination of all practices included in a FORPLAN prescription, these standards had a net positive effect in terms of PNV for each prescription. This is due to the joint production nature of forest production functions and the multiple-use benefits for which each prescription was developed. Analysis of prescriptions using the Steady State model, examination of prescriptions by the management team and field personnel, and careful design of the final set of prescriptions incorporating the on the ground knowledge of these people assured that the standards included in FORPLAN prescriptions and displayed in Management Area Direction were the most cost efficient for achieving the desired results. Further, this effort focussed on assuring that standards were not compounding in their effect. In fact, one of the major reasons for the three stage linear programming procedure and use of contiguous analysis areas was to facilitate development of cost efficient, multiple-use FORPLAN prescriptions tailored to the specifics of each individual analysis area. This tailoring included a tailoring of the standards necessary for meeting legal minimums and coordination requirements of 36 CFR 219.

To develop an approximation of the cost of all MMRs, two FORPLAN runs using identical constraints were made. In one of these, all costs associated with multiple-use input on project planning, coordination requirements and monitoring were eliminated. Results showed that the basic allocation did not change. However, there was an increase in acres managed for timber, an increase in PNV, and an increase in allowable sale quantity. Briefly, PNV increased by $5. MM or less than 0.1% increase; timber production in the first 10 years increased by 8 %; and area managed for timber increased by 12 %. There were no other significant changes which could be estimated. These values can be considered the cost of meeting minimum management requirements.

Standards for Management of Grizzly Bear Habitat

A portion of management direction included in all prescriptions are standards and guidelines for the protection and recovery of the grizzly bear; a threatened species in the Yellowstone ecosystem. The standards included in each prescription are based on the "Grizzly Bear Guidelines." The most restrictive of these standards apply to habitat deemed essential to recovery of the bear; this habitat is referred to as Situation I lands.

Situation I lands comprise 412,000 acres of the Forest. Most of these lands are within wilderness areas where there is little opportunity for production of commodities. The major impact of managing under the "Grizzly Bear Guidelines" within wilderness areas in terms of opportunity costs is in recreation. Most of the restrictions on recreation are on how camps are set up and restrictions on storage of food. This does not appear to have a measurable negative effect on recreation use.

Outside of wilderness, the standards for Situation I lands allow for harvesting timber, grazing domestic livestock, and recreation use of the area. Like recreation within wilderness, these standards do not effect the amount of production; however, they do effect to some extent the cost of operations. For example, timber harvest can be done in the same way as outside of Situation I except roads are closed to public use, and logging camps are not allowed in Situation I. Neither of these restrictions effects the amount of timber produced, but add marginally to the cost for the operator and administration of a sale.

The most significant impacts are from restrictions on hunting of black bears and on oil and gas operations. All lands except a half mile band within Situation I outside of wilderness under all alternatives carry the recommendation to deny lease. Leasing of lands within the half mile band is allowed under a "no surface occupancy" stipulation where there is a reasonable opportunity to explore and develop the resource under such a stipulation. Because it is impossible to assess oil and gas reserves without drilling a well, it is impossible to determine opportunity costs in terms of oil and gas production.

Hunting of black bears sometimes included bear baiting. Bear baiting is not allowed within Situation I and II. From past State hunting reports, an estimated loss of 250 hunter days annually can be attributed to this restriction. Using the RPA value for big game hunting, this results in an opportunity cost of $10,250. per year.

Beyond these opportunity costs are the direct cost of managing under the "Grizzly Guidelines." These costs include support of a treatened and endangered species wildlife biologist, provision of food storage facilities within Situation I for recreationalists, an information and education program dealing with the grizzly bear, signing, coordination efforts with other agencies and Forests within the Yellowstone ecosystem, preparation of biological assessments/evaluations, consultation with the U.S. Fish and Wildlife Service, special law enforcement efforts and program management. The costs of these actions for FY 1985 is $196,340.

Total cost of managing under the "Grizzly Bear Guidelines" then is:

Opportunity cost of hunting	$ 10,250.
Direct Management Cost	196,340.
	$206,590. per year

Dispersion of Timber Harvests. "Dispersion" of harvests is defined by three parameters: size of area within a cut block for even-age timber management (clearcut or shelterwood); distance between cut blocks; and the time allowed for vegetation to recover before adjoining areas are cut. There are many reasons for dispersion including enhancement of visual quality, enhancement of wildlife habitat, protection of seedlings by providing a favorable micro-climate, assurance of an adaquate seed source in some timber species, protection of trees along the edge of a cut from wind throw and protection of soil productivity and water quality. Not all of these factors come into play in any one cut, but a some are associated with each harvest.

The NFMA of 1976 states that the Secretary of Agriculture will develop standards for the application of even-age silviculture in terms of a size limit on cut blocks. This was done in the implementing regulations by timber species and geographic areas. For the specicies/timber types on the Shoshone, that size was 40 acres. Spacing and timing requirements for dispersion vary by management intent and the specifics of the timber type and site type being treated.

Based on the above, there was a need to include dispersion standards when modeling timber in FORPLAN to assure that harvests planned in analysis met these legal requirements as well as the management intent and site specific factors included in analysis.

Conventional timber harvest scheduling procedures make inclussion of these considerations difficult. There are many factors contributing to this. First is the nature of analysis areas; they are normally forestwide and have no spatial relationships built into them. Secondly prescriptions for timber harvest scheduling focus on per acre yields, costs and effects with the assumption that these are linear in nature; e.g. if one acre produces 3000 cubic feet of timber (MCF), then 2 acres produce 6 MCF, and 500 acres produces 1500 MCF. (This assumption is valid for timber yields as long as such factors as need for adaquate seed sources, micro-climate protection, and wind throw are not problems. It may not be valid for costs including those associated with timber management or for effects on other resources such as visuals, water quality, soil productivity, or wildlife.) The third factor is a function of how a linear program searches for a solution. In linear programming, the model does a comparative search of paths and selects the path that appears to be most beneficial in terms of the objective function. For example, one path yields a net of $60. per acre and another path yields $40. per acre, the linear program will select the $60 path and try to get as much of that as it can.

What all of this translates into is the inability to model spatial arrangements using forestwide analysis areas and the fact that the model will attempt to select the entire contents of an analysis area for harvest in a single time period. This is fine if all stands within that analysis area are less than 40 acres in size and are already well dispersed. If they are not, then there is no assurance that dispersion standards will be met by the resulting harvest schedule. In other words, there is no assurance that the solution from the FORPLAN model meets legal minimums and that the resulting alternative is implementable.

There appears to be two ways to address this problem. One is to use right hand side constraints by geographic area to try and assure that dispersion standards are being met. The other is to "build in" dispersion standards as part of the structure of the FORPLAN model. The latter strategy was chosen on the Shoshone. Reasons and documentation on how this was done are in Planning Records.

Building dispersion standards into prescriptions for the final FORPLAN model allowed for accurate estimates of costs of meeting such standards while doing timber management work. This also provided a mechanism to integrate timber management with management of other resources and design standards to enhance production of forage for cattle, wildlife habitat, visual quality, and/or water production. In this way, the full set of goods and services produced through management of timberland can be accounted for in the FORPLAN model as can the economic benefits. In short, there were many advantages for building these standards into prescriptions in an attempt to accurately analyze alternative management strategies to resolve issues, concerns and opportunities.

A disadvantage of building these standards into prescriptions rather than using right hand side constraints is that testing of the effects of these standards was more difficult. This problem was overcome by using the timber only FORPLAN model. Analysis areas, basic yield tables, timber management costs, and timber management regimes were the same in both the final model and the timber only model. The major difference was that the timber only model did not have dispersion standards built into prescriptions while the final model did. A set of runs was made with the timber only model to mimic the maximum timber benchmarks created using the final model. The schedules and flows of timber resulting from these runs in both models were compared. These results are documented in Planning Records. Briefly, there was no apparent effect of dispersion standards on the volumes produced by decade with the exception of the maximum timber with unconstrained flow. Because this benchmark produced an unreasonable schedule any way, a flow that had even higher peaks and lower valleys didn't appear significant.

The major effect of dispersion standards was how much of each analysis area was harvested in any single decade. The timber only model tended to concentrate harvests in few analysis areas each decade, while the final model "dispersed" these harvests over a number of analysis areas. An apparent reason for no effect on timber yields by decade is the skewed age distribution of the Forest. Over 50 percent of the even-aged, tentatively suitable timberland has mature to overmature timber on it. This means that constraints on flow from decade to decade have the overriding effect on the amount of volume produced in any one decade. Dispersion standards merely altered how much of each analysis area harvested with volumes being roughly the same (+/- 5 to 8 percent in any one decade).

Based on this analysis, the conclusion was that there is no significant effect of dispersion standards modeled in the final FORPLAN model in terms of volumes produced and flow of timber. Because such standards provide some assurance that resulting schedules are implementable, a decision was made to keep them in the final model.

Non-declining Flow. Non-declining flow constraints force timber harvest each decade to be at least as great as the decade proceding it. These constraints provide the mechanism for accurately portraying the non-declining flow policy of the Forest Service. These constraints were included in all alternatives, but before alternatives were created, they were tested to identify their major effects. Testing was done using five separate benchmarks. Three of these had the objective of maximizing timber over the first 5 decades and all used a maximum PNV final objective function. Results for the three timber maximum runs can be seen in the benchmark tables. Briefly:

Benchmark	1st decade harvest	PNV
5	16.9 MMBF	$4.434 Billion
11	14.8 MMBF	$4.440 Billion
12	26.2 MMBF	$4.425 Billion

Where in benchmark 5 flow was constrained to go no more than 15 percent greater and no less than 10 percent less by decade.

Benchmark 11 was constrained to non-declining flow.

Benchmark 12 had no flow constraints on it.

As can be seen, flow constraints had no apparent effect on present net value. The differences shown are well within the round off errors of the model and for all practical purposes are exactly the same. Benchmark 12 yielded a very unreasonable flow, where most of the suitable timber land was cut over the next 6 decades and then no real harvest after that for about six decades and then a swing upward again. Thus this did not appear to provide a real comparison.

The differences between benchmark 5 and 11, though provide an indication of the effect of non-declining flow. Again, no apparent effect on PNV, but a slightly higher annual average volume for the first decade when there is a moderate departure from even flow. Though this moderate departure produced more timber in the first decade, both benchmark 5 and 11 produced average annual volumes in excess of the average level actually cut and sold over the last decade. That volume was about 8.5 MMBF per year even though more volume was prepared for sale. Using this as an indication of local market conditions, there did not seem to be any reason to study a departure alternative beyond this point.

The other two benchmarks done to test the effects of non-declining yield were benchmarks 4 and 13. Both of these benchmarks had the objective of maximizing present net value using both market and assigned values. The constraints used were the same. No minimum level for any goods or services were included. The only difference is that benchmark 4 used the "standard timber flow constraint" of letting flow increase by 15 percent or decrease by 10 percent by decade and benchmark 13 had a non-declining flow constraint. The difference in PNV of these two runs were well within the round off errors of the model; so they were not deemed significant. Benchmark 4 produced an average annual yield of 11.5 MMBF while 13 produced 10.7 MMBF. Thus the effect in the first decade was .8 MMBF or about 7 percent difference. Over 50 years, the difference between these two runs was even less and their long term sustained yield was about 3 percent lower on benchmark 13 than benchmark 4. Given the accuracy of data included in the model and model round off errors, these results show perhaps a slight decrease in timber production resulting from the non-declining yield policy; but that decrease appears to be insignificant for all practical purposes. Again, like the timber analysis of non-declining flow, there did not seem to be a reason to persue a departure from even flow in alternatives based on this analysis.

Constraints Unique to Benchmarks. Ten of the benchmarks had no right hand side constraints other than constraints on timber flow already discussed. The other 7 benchmarks included unique right hand side constraints. These 7 benchmarks are:

Minimum Level	constraint was to allow only minimum level prescriptions to be picked by FORPLAN.
Current Direction	constraints included a specification of the minimum amount of timber to be produced in the first decade and to allow only prescriptions representing current direction to be picked by FORPLAN.
Optimum Recreation	a set of constraints by District representing the maximum amount of recreation that would be consumed over the first decade by recreation type was used.

Grizzly Bear Enhancement	a constraint requiring that all Grizzly Bear Situation 1 areas be managed under enhancement management strategies to achieve a recovered population sooner than would be possible under the Grizzly Bear Guidelines.
District Needs	a constraint requiring the prescription identified by Rangers for each analysis area that resolved the most pressing management problems be selected by FORPLAN.
Reduced Budget	a constraint on the first decade budget to place an upper limit at 75 percent of the fiscal year 1982 budget.
Amenity	a constraint to allow only prescriptions that emphasized high quality water, low density recreation, and/or enhancement of wildlife habitat to be selected by FORPLAN.

Minimum level constraint. This constraint was necessary to generate the minimum level benchmark. This benchmark is required to provide a basis of comparison with all other benchmarks of incremental costs and benefits. The effects of this constraint are shown in table B - 1. Because it is a required benchmark developed for comparison reasons, a discussion of the effect of this constraint in terms of production levels for goods and services and in terms of reduction in PNV from benchmark 4 does not appear appropriate.

Minimum timber production for current direction benchmark. Constraints by major market area setting a minimum for timber production in the first decade was used. Timber production in this benchmark exceeded this floor based on the present net value of that production. Thus this constraint had no effect on the solution, on the mix and amounts of goods and services produced, nor on the present net value of this benchmark.

Current direction prescription constraint. This constraint was used to allow only prescriptions representing current direction to be considered and selected by FORPLAN. This constraint was needed to meet the intent of thie required benchmark. There are slight variations in all output levels and effects between this benchmark and benchmark 4. Many of these relate to the fact that benchmark 4 placed a number of analysis areas into minimum level management, while current direction calls for active management of all areas on the Forest including pristine wilderness. The present net value of current direction is $4.233 billion as opposed to $4.441 billion for benchmark 4. Much of this difference is due to benchmark 4 not actively managing all parts of the Forest. Also, it appears that the level of grazing of domestic livestock and harvest of timber under current direction are slightly higher than that which is economically efficient. Again, at least for the timber, this is due in part to benchmark 4 placing lands into minimum level management.

Optimum Recreation constraint. This set of constraints was used to investigate the effects of maximizing recreation opportunities on the Forest. Recreation use on the Forest includes a wide variety of recreation opportunities. Maximizing one or the other did not appear to provide an adaquate measure of the effects of maximizing recreation on the Forest. Based on past use trends and population estimates, this set of constraints represents the maximum amount of each type of recreation that would be consumed in the first 10 years. These estimates were localized down to the District level to improve the estimate of effects. Compared to benchmark 4, this caused an increase in most types of recreation, an increase in forage on suitable rangeland for wildlife, a marked decrease in forage for domestic livestock, and a slight decrease in timber production. The present net value of this benchmark is $4.427 billion as opposed to $4.441 for benchmark 4; not a significant decrease. This illustrates the point that much of the benefit values associated with management of the Forest are due to production of non-commodities including recreation and wildlife.

Grizzly Enhancement constraint. This constraint was developed to investigate the effects of going beyond the Grizzly Bear Guidelines to achieve a recovered population sooner. This constraint called for prescriptions which enhanced recovery for all Grizzly Bear situation 1 lands (essential habitat). Doing this brought about a slight decrease in most types of recreation, increased wildlife forage on suitable rangeland, decreased grazing of domestic livestock, and had a slight decrease in timber harvest when compared with that produced in benchmark 4. The present net value of this alternative was $4.425 billion as compared to $4.441 billion for benchmark 4; a slight decrease.

District "Needs" constraint. As FORPLAN prescriptions were being developed for the final model, each Ranger identified the prescription that appeared to solve the most pressing problems on each analysis area. This was done with no forest-wide management strategy in mind; just concentrating on the existing conditions of each analysis area and the issues and concerns surronding management of that area. This constraint was used to investigate the forest-wide effects of each of these selections; it allowed only those prescriptions so identified by Rangers to be selected by FORPLAN. As compared to benchmark 4, this provided an increase in all recreation types except dispersed nonmotorized, nonwilderness recreation, an increase in timber, an increase in forage for both wildlife and domestic livestock through more intensive range management and wildlife management and no real decrease in present net value.

Reduced Budget constraint. This constraint was used to investigate the effects of a 25 percent reduction in budget from the fiscal 1982 budget. As compared to benchmark 4, the effects of this constraint are significant: the entire timber program is eliminated; there is a dramatic decrease in grazing of domestic livestock; and a decrease in all types of recreation provided. The present net value of this benchmark is one of the smallest of all benchmarks and given the range of PNVs is significantly less than benchmark 4.

Amenity constraint. As prescriptions were being developed for the final FORPLAN model, those prescriptions which emphasized high quality water, low density dispersed recreation and/or wildlife habitat improvements were identified. This constraint allowed only those prescriptions so identified to be selected by FORPLAN. The results as compared to benchmark 4 show an increase in all types of recreation except developed recreation, a dramatic decrease in grazing of domestic livestock, and a moderate decrease in timber production. Forage available on suitable lands for wildlife increased. The present net value of this benchmark was $3.804. This is the lowest of all benchmarks that included both market and assigned values in calculation of PNV and is significantly lower than the PNV of benchmark 4.

Ranking of Benchmarks by Present Net Value. The final objective function for all benchmarks was maximization of present net value. This assured that results from each benchmark represented the most cost efficient way the objectives of that benchmark could be met. It also meant that results from benchmark to benchmark were comparable because they had all used the same objective function.

Another result of using maximization of present net value as the objective function for all benchmarks was that for many analysis areas, the same prescription was chosen for each analysis area in a number of benchmarks. This occurred for two reasons. First, about 50 percent of the Forest is wilderness where management opportunities are very limited. For each of the wilderness analysis areas, there is a single prescription that will maximize present net value. For benchmarks such as all of the maximum present net value benchmarks and maximum timber benchmarks, the objective of the benchmark does not effect how wilderness should be managed; this is left to the objective function of maximization of present net value given the objectives of that benchmark. So for each of these benchmarks, the same FORPLAN prescription is chosen for wilderness analysis areas.

A second reason that the same FORPLAN prescription is chosen for an analysis area in a number of benchmarks is that the objectives of those benchmarks are very compatible in terms of on-the-ground management. For example, an analysis area may have rangeland suitable for domestic livestock grazing, tentatively suitable timber, and an area available for motorized recreation. Given that all FORPLAN prescriptions are mini-plans that provide for coordinated multiple-use management of an analysis area, the same prescription for this area may provide for maximizing forage for domestic livestock, maximizing timber production, and providing desired amounts of motorized recreation opportunities. This means that this same prescription may be chosen by benchmarks whose objectives are to maximize AUMS for domestic livestock, maximize cattle AUMS, maximize timber, or optimize recreation. Further, depending on the PNV of that prescription compared to other prescriptions designed for that analysis area, it may have the highest PNV and therefore be the one selected in such benchmarks as 3, 4, 13, and 15.

These reasons, in part, explain the apparent narrow range in PNV between many of the benchmarks. Again, there is about 50 percent of the Forest in wilderness or wilderness study areas, tentatively suitable timberland comprises only about 5 percent of the Forest, and rangeland suitable for grazing of domestic livestock amounts to a maximum of about 12 percent of the Forest. These factors plus the use of maximization of PNV as the objective function for all benchmarks have contributed to an apparently narrow decision space for alternatives.

In consideration of the above discussion, it should be remembered that the prescriptions in the final FORPLAN model were developed based on prior linear programming analysis. In the steady state model, all reasonable prescriptions were developed for each analysis area and a set of benchmarks and preliminary alternatives were analyzed for cost efficiency. Only those prescriptions that were cost efficient in meeting the objectives of each benchmark were represented in the final FORPLAN model.

A listing of benchmarks by present net value is presented next showing both the total PNV and PNV netting out the PNV of the minimum level benchmark. The "Max PNV using market values only" benchmark includes only benefit values for timber, range, and developed recreation in both the objective function and value reported. If assigned values for other goods and services were included in the value reported (but not in the objective function) then the PNV reported for this benchmark would be the same as the "Max PNV using market and assigned values." In other words, the basic solutions were identical for these two benchmarks with the differences in PNV illustrating the relative value of commodities and non-commodities on the Forest.

There was a minor drop in PNV between benchmark 4 and the Max timber with non-declining flow. As compared with benchmark 4, this benchmark increased timber production and lands suited for such production; increased access which in turn increased all forms of recreation except developed private recreation; and kept range management about the same. It appears that the cost of putting more lands under management and improving access were compensated for by timber benefits and benefits from recreation particularly dispersed recreation of all types including wilderness.

The PNV of the "District Needs" benchmark was down a minor amount from benchmark 4 (in fact, like in the last discussion, the change in PNV is within round-off errors and may not exist). This benchmark intensified range management; increased access a moderate amount with subsequent slight increases in most forms of recreation; and increased timber production a slight amount.Differences between this benchmark and benchmark 4 are minor. It appears that there is a wide variation in goods and services that can be produced without altering PNV significantly given the results of the top 3 benchmarks when ranked by PNV.

The "Max timber with standard timber flow constraint" significantly increased timber production and lands managed for timber. This increased access to support nonmotorized recreation, but closed most roads not needed for access. The combined effect of this was an increase in nonmotorized recreation including wilderness recreation from benchmark 4; with a decrease in motorized recreation. Range and wildlife remained about the same as in benchmark 4, but water production increased because of the increase in roads and timber harvest. The net effect was less than a 2 percent decrease in PNV from benchmark 4.

Maximizing PNV with non-declining yeild resulted in a decrease in PNV of less than 2 percent from benchmark 4. The only difference between this benchmark and benchmark 4 was a slight decrease in timber production.

Maximizing production of forage for domestic livestock traded off AUMs from wildlife to cattle and sheep when compared with benchmark 4. This plus a slight variation in the mix of recreation produced accounts for the shift in PNV from benchmark 4.

Maximizing production of forage for cattle traded off AUMS from domestic sheep and gave them to cattle; with a decline in the amount of forage available for wildlife. This also resulted in a slight variation in the mix of recreation when compared with benchmark 4. These two effects account for the drop in PNV from benchmark 4.

Optimizing recreation when compared with benchmark 4 increased all types of recreation including hunting and fishing; increased forage available for wildlife on suitable range; and significantly decreased the amount of forage available for domestic livestock. These changes account for the drop in PNV between this benchmark and benchmark 4.

Ranking of Benchmarks by Present Net Value

BENCHMARK	PNV	PNV-MIN. LEVEL
Max PNV using market and assigned values	$ 4,441 MM	$ 361. MM
Max Timber with non-declining flow constraint	4,440 MM	360. MM
District Needs	4,440 MM	360. MM
Timber with standard timber flow constraint	4,434 MM	354. MM
Max PNV using market and assigned values and non-declining flow constraint	4,434 MM	354. MM
Max forage for domestic livestock	4,433 MM	353. MM
Max forage for cattle	4,429 MM	349. MM
Optimize Recreation	4,427 MM	347. MM
Grizzly Bear Enhancement	4,425 MM	345. MM
Max Timber with unconstrained flow	4,425 MM	345. MM
Max Wildlife Forage	4,356 MM	276. MM
Current Direction	4,233 MM	153. MM
Reduced Budget	4,209 MM	129. MM
Max Water	3,838 MM	-242. MM
Amenity	3,804 MM	-276. MM
Max Wilderness	3,800 MM	-280. MM
Max PNV using market values	1,395 MM	-2,685. MM

TABLE B-1

Benchmark Output Summary

Item	Units[10]	Benchmark Number and Name 1 Minimum Level	2 Current	3 PNV Market Only	4 PNV Market + Assigned	5 Timber	6 Range	7 Recreation	8 Wildlife	9 Water
Dispersed Wilderness	MRVD[1]	5.74	202.	145.	145.	153.	171.	224.	209.	96.5
Dispersed Nonmotorized	MRVD[1]	15.6	52.5	50.3	50.3	55.3	44.5	50.1	63.6	65.3
Dispersed Motorized	MRVD[1]	3.5	1030.	974.	974.	485.	1202.	1114.	551.	1168.
Developed Public	MRVD[1]	--	271.	253.	250.	264.	250.	287.	256.	269.
Developed Private	MRVD[1]	--	151.	150.	150.	55.2	81.6	136.	150.	53.9
Wildlife Use	MWUD[1,2]	13.8	197.	187.	188.	194.	185.	216.	183.	161.
Fish Use	MFUD[1]	5.72	94.3	94.5	94.5	97.1	96.0	104.	92.5	84.3
Sage Mgt Wildlife	AC[3]	--	4290.	4360.	4360.	3640.	4700.	5750.	7420.	7310.
Aspen Mgt Wildlife	AC[3]	--	4650.	3550.	3550.	3330.	3800.	4700.	4680.	6440.
Wildlife Forage	MCAUM[1,4]	134.	38.7	45.9	44.8	44.8	33.5	65.0	134.	91.2
Cattle Forage	MCAUM[1]	--	78.4	71.0	71.0	70.7	83.1	50.3	--	44.5
Sheep Forage	MSAUM[1,5]	--	39.2	38.8	38.8	40.0	43.0	36.4	--	13.7
Timber North	MMBF[1,6]	--	4.8	4.1	4.1	6.7	4.2	4.6	3.8	4.9
Timber South	MMBF[1,6]	--	7.4	7.4	7.4	10.2	7.5	6.2	5.7	8.9
Timber Suitable	MAC	--	116.	104.	104.	122.	113.	97.0	81.3	131.2
Water Increase	MAF[7]	--	4.94	4.50	4.46	7.45	4.94	4.59	4.43	9.40
Enhanced Summer Runoff	AF[7]	--	--	--	--	--	--	--	21.	2680.
Large Group Camps	CAMPS[8]	--	310.	243.	243.	268.	281.	287.	218.	231.
Budget	MM$[1,9]	.372	4.7	3.73	3.76	4.55	4.25	4.27	3.36	4.51
Discounted Costs[11]	MM$[9]	8.9	107.	83.	84.	103.	96.	96.	74.	102.
Discounted Benefits[11]	MM$[9]	4089.	260.	-2802.[12]	445.	457.	449.	443.	350.	-140.
Present Net Value[11]	MM$[9]	4080.	153.	-2885.[12]	361.	354.	353.	347.	276.	-242.
Benefit/Cost Ratio[11]	NA	459.	2.4	-34.[12]	5.3	4.4	4.7	4.6	4.7	-3.4

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1 per year for the first decade
2 half are consumptive, half are noncomsumptive
3 figure shown is total acres under periodic treatment, not acres treated first decade
4 in Cattle AUMS (2 Elk AUM = 1 Cattle AUM)
5 Sheep AUMS (1 Sheep AUM = 1/5 of a Cattle AUM)
6 using regional average conversion of 4.45 MBF/MCF, Sawtimber plus poletimber
7 average per year for first 50 years
8 allocation of large group camps to public versus private not established here
9 1982 dollars
10 MRVD=thousand recreation visitor days, MWUD=thousand wildlife user days, MFUD=thousand fish user days, AC=acres, MCAUM=thousand cattle animal unit months, MSAUM=thousand sheep unit months, MMBF=million board feet, MAC=thousand acres, MAF=thousand acre-feet, AF=acre-feet, MM$=million dollars
11 values for all benchmarks except Benchmark 1 are incremental from Benchmark 1.
12 does not include assigned values.

TABLE B-1 (Continued)

Benchmark Output Summary

Item	Units[10]	10 Grizzly Enhancement	11 Timber Non-decline	12 Timber Unconstrained	13 Market+ Assigned Nndeclin	14 District Needs Only	15 Budget Market+ Assigned	16 Amenity	17 Cattle	18 Maximum Wilderness
		Benchmark Number and Name								
Dispersed Wilderness	MRVD[1]	156.	153.	178.	146.	176.	106.	189.	169.	265.
Dispersed Nonmotorized	MRVD[1]	45.5	60.6	61.4	50.1	46.1	45.7	55.	45.1	8.31
Dispersed Motorized	MRVD[1]	958.	1201.	1240.	974.	1003.	826.	1019.	1083.	790.
Developed Public	MRVD[1]	259.	264.	264.	253.	286.	171.	238.	250.	251.
Developed Private	MRVD[1]	113.	55.2	55.2	150.	151.	92.4	148.	81.6	150.
Wildlife Use	MWUD[1]	198.	194.	194.	188.	192.	140.	184.	92.4	184.
Fish Use	MFUD[1]	97.9	97.3	97.9	94.5	89.0	68.6	94.1	96.9	94.0
Sage Mgt Wildlife	AC[3]	5230.	3420.	3850.	4360.	6510.	2950.	5520.	4570.	6010.
Aspen Mgt Wildlfe	AC[3]	5040.	3320.	3550.	3550.	5370.	3040.	3124.	3750.	4190.
Wildlife Forage	MCAUM[1,4]	54.8	45.8	47.8	46.2	46.7	83.8	117.6	38.2	71.0
Cattle Forage	MCAUM[1]	59.1	70.5	68.1	70.6	77.3	41.6	19.7	88.3	65.9
Sheep Forage	MSAUM[1,5]	39.2	39.0	39.0	36.8	31.2	24.0	11.4	31.8	36.2
Timber North	MMBF[1,6]	3.0	6.4	11.1	3.6	4.8	--	2.3	4.2	3.6
Timber South	MMBF[1,6]	7.4	8.4	15.1	7.1	7.3	--	6.1	7.5	6.3
Timber Suitable	MAC	99.2	136.	130.	80.5	116.	--	74.5	114.	77.5
Water Increase	MAF[7]	4.53	6.55	7.70	4.04	5.2	1.50	3.97	4.88	4.43
Enhanced Summer Runoff	AF[7]	--	--	--	--	--	--	--	--	--
Large Group Camps	CAMPS[8]	241.	268.	268.	243.	309.	169.	222.	275.	285.
Budget	MM$[1,9]	3.99	4.47	4.81	3.70	4.60	2.43	3.49	4.19	4.24
Discounted Costs[11]	MM$[9]	89.	101.	109.	82.	104.	52.	77.	94.	91.
Discounted Benefits[11]	MM$[9]	434.	461.	454.	436.	464.	181.	-199.	443.	-189.
Present Net Value[11]	MM$[9]	345.	360.	345.	354.	360.	129.	-276.	349.	-280.
Benefit/Cost Ratio[11]	NA	4.9	4.6	4.2	5.3	4.5	3.5	-2.6	4.7	-2.1

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5 Sheep AUMS (1 Sheep AUM = 1/5 of a Cattle AUM)
6 using regional average conversion of 4.45 MBF/MCF, Sawtimber plus poletimber
7 average per year for first 50 years
8 allocation of large group camps to public versus private not established here
9 1982 dollars
10 MRVD=thousand recreation visitor days, MWUD=thousand wildlife user days, MFUD=thousand fish user days, AC=acres, MCAUM=thousand cattle animal unit months, MSAUM=thousand sheep unit months, MMBF=million board feet, MAC=thousand acres, MAF=thousand acre-feet, AF=acre-feet, MM$=million dollars
11 values for all benchmarks except Benchmark 1 are incremental from Benchmark 1.

TABLE B-2

Possible Range of Outputs from Benchmarks

Item	Units[10]	Minimum Considering Benchmark #1	Minimum Excluding Benchmark #1	Maximum Excluding Benchmark #1	Maximum Considering Benchmark #1
Dispersed Wilderness	MRVD[1]	5.74	96.5	265.	265.
Dispersed Nonmotorized	MRVD[1]	8.31	8.31	65.3	65.3
Dispersed Motorized	MRVD[1]	3.5	485.	1240	1240.
Developed Public	MRVD[1]	-	171.	287.	287.
Developed Private	MRVD[1]	-	55.2	151.	151.
Wildlife Use	MWUD[1,2]	13.8	92.4	216.	216.
Fish Use	MFUD[1]	5.72	68.6	97.1	97.1
Sage Mgt Wildlife	AC[3]	-	2950.	7420	7420.
Aspen Mgt Wildlfe	AC[3]	-	3040.	6440	6440.
Wildlife Forage	MCAUM[1,4]	13.7	13.7	134.	134.
Cattle Forage	MCAUM[1]	-	0	88.3	88.3
Sheep Forage	MSAUM[1,5]	-	0	43.0	43.0
Timber North	MMBF[1,6]	-	0	11.1	11.1
Timber South	MMBF[1,6]	-	0	15.1	15.1
Timber Suitable	MAC	-	0	136.	136.
Water Increase	MAF[7]	-	1.5	9.4	9.4
Enhanced Summer Runoff	AF[7]	-	0	2680	2680.
Large Group Camps	CAMPS[8]	-	169.	310.	310.
Budget	MM$[1,9]	.372	2.15	4.7	4.7
Discounted Costs[11]	MM$[9]	8.9	52.	109.	109.
Discounted Benefits[11]	MM$[9]	-2802.[12]	-2802.[12]	464.	NA
Present Net Value[11]	MM$[9]	-2885.[12]	-2885.[12]	361.	NA
Benefit/Cost Ratio[11]	NA	-34.[12]	-34.[12]	5.3	NA

1 per year for the first decade
2 half are consumptive, half are noncomsumptive
3 figure shown is total acres under periodic treatment, not acres treated first decade.
4 in Cattle AUMS (2 Elk AUM = 1 Cattle AUM)
5 Sheep AUMS (1 Sheep AUM = 1/5 of a Cattle AUM)
6 using regional average conversion of 4.45 MBF/MCF, Sawtimber plus poletimber
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11 values are incremental from Benchmark 1.
12 does not include assigned values.

The major difference between maximum enhancement of grizzly bear habitat and benchmark 4 is a decrease in grazing of domestic livestock in grizzly bear situation I areas. This plus slight variations in recreation produced and a minor decrease in timber produced accounts for the drop in PNV from benchmark 4.

Maximizing timber production with no constraints on flow significantly increased first decade timber harvest and had the greatest amount of lands in timber management. This resulted in an increase in roads and a dramatic increase in water production. It decreased forage for domestic livestock and increased most forms of recreation when compared with benchmark 4. These changes account for the drop in PNV between this benchmark and benchmark 4.

Maximizing forage available for wildlife on suitable range eliminated grazing of domestic livestock. When compared with benchmark 4, it increased nonmotorized and wilderness recreation; decreased motorized recreation; and decreased timber harvest and the amount of lands in timber management. These changes account for the drop in PNV from benchmark 4.

Current direction produces more recreation of all types; more forage is available for domestic livestock; and there is a slight increase in timber management when compared with benchmark 4. These shifts account for the difference in PNV between this benchmark and benchmark 4.

The reduced budget benchmark eliminates the timber program and decreases production of all other goods and services except forage available to wildlife on suitable range. All of these decreases account for the significant change in PNV between this benchmark and benchmark 4.

Maximizing water decreases significantly nonmotorized and wilderness recreation, and forage available for domestic livestock. It increased the amount of roads on the Forest and timber management when compared with benchmark 4. The combination of decreased recreation and range benefits combined with increased road costs account for the very low PNV of this benchmark.

Maximizing amenity values provided the lowest PNV of all benchmarks where PNV was calculated using both market and assigned values. There was a moderate increase in recreation produced, but this did not appear to offset costs of managing that recreation, maintaining the transportation network and significant losses of benefits from grazing of domestic livestock and timber harvest. These shifts account for the difference in PNV between this benchmark and benchmark 4.

SOCIAL AND ECONOMIC IMPACT ANALYSIS

OVERVIEW

A consideration in formulating and selecting an alternative that will maximize net public benefit, is the impacts produced on local social and economic systems. To estimate these impacts, social and economic impact analysis of benchmarks and alternatives was done. Because impacts on social systems are highly dependent on economic impacts, social impact areas and economic impact areas were defined using identical boundaries. The two areas used conformed to county boundaries and were Park County, Wyoming, for impacts resulting from management of the northern three Ranger Districts and Fremont County, Wyoming, for impacts resulting from management of the southern two Ranger Districts. Defining social impact areas in the same terms as economic impact areas allowed for close coordination between the two types of effects and facilitated estimates of impacts. (The Forest does lie in 3 additional counties, but both economic and social impacts on these are indignificant.)

SOCIAL IMPACT ANALYSIS

A first source of information for social impact analysis used data generated according to Foundation for Urban and Neighborhood Development (FUND) procedures. Human Resource Units (HRUs) were delineated and characterized by District personnel most familiar with them. This information was compiled and updated in Human Resource Descriptions for the Shoshone National Forest booklet located in Planning Records. Further, this information was used to characterize the social systems for each social impact area as depicted in Chapter II of this document.

To expand this information base, a procedure developed by Dr. David Freeman of the Colorado State University was employed (see Management Alternatives for Natural Resources, Freeman, 1981). This procedure was aimed at identifying what aspects of forest plan alternatives would highten or decrease polarization in local social systems. It was felt that polarization of groups within a social system would be detrimental to attitudes, beliefs, life-styles and the ability of such social systems to respond to changes. Polarization often leads to groups on either side of an issue to organize and then fight in public forums for their particular interest. As such, polarization has a divisive influence and saps resources (volunteer time, donations and public interest) from community betterment programs and maintenance of social networks.

To provide input for analysis of polarization, a series of public meetings was held in Cody, Dubois and Lander. The final meetings in Cody and Lander were all day work sessions where participants were asked to provide input on preliminary alternatives. The procedures used and results from these meetings can be found in a document titled "Social Impact Assessment on the Shoshone National Forest" documented in Appendix F.

The results of analysis documented in the Human Resource Descriptions for the Shoshone National Forest include a characterization of the lifestyles, attitudes, beliefs, values and social organizations and networks for each HRU. The results of the social impact assessment procedure was a ranking of alternatives in terms of their effect on polarization within communities caused by various alternatives. This ranking of polarization and the characteristics of that polarization as described in Appendix F, provided data for identifying the probable social impacts of alternatives. Social impacts were described in terms of effects on lifestyles, attitudes, beliefs, values and social organization.

The results of this analysis were compared with the results of economic impact analysis done for the same counties. It was found that the results of both were highly correlated. Because of this, economic impact analysis for the final set of alternatives was combined with information gathered in the first set of social impact assessment meetings to provide the basis for estimating social impacts of each alternative.

ECONOMIC IMPACT ANALYSIS

IMPLAN, an economic input/output model, developed by the Forest Service was used for economic impact analysis (see "IMPLAN: AN INPUT-OUTPUT ANALYSIS SYSTEM FOR FOREST SERVICE PLANNING," by G.S. Alward and Charles J. Palmer available in planning records). Two IMPLAN datasets were created; one for Fremont County, and one for Park County. Both of these models are hybrid models composed of primary and secondary data.

Secondary data came from the national database assembled by the Forest Service. The data represent 1977 county-level economic activity for 466 economic sectors. The data were derived from the 1972 Commerce Department national input-output model. Tables were updated to 1977 using relative price changes and these tables were calibrated using the 1977 National Income and Product Accounts. Source of data for gross output and employment estimates included the Census of Agriculture (1977), Agricultural Statistics (1979), Census of Housing (1970) and Census of Governments (1977). All data were adjusted to 1977 base year and unreported data were estimated.

In order to deal effectively with one of the major issues facing management of the Forest, primary data was collected as needed to build in a separate sector for outfitter and guide operations. This data were collected by Charles Palmer using confidential interviews with existing outfitters and guides. Summaries of this information are available in planning records.

These two IMPLAN models were used to estimate effects in terms of changes in income, population, and industry employment by sector within each County. Results for economic impact analysis of benchmarks are presented in Table B-3.

PUBLIC INVOLVEMENT PRIOR TO FORMULATION OF ALTERNATIVES

After completion of steady state analysis of benchmarks and preliminary alternatives, involvement of the public in planning and analysis was begun. This began with four meetings in March and April of 1984. In these meetings the process used in planning and such items as analysis areas and prescriptions were presented to the public. Also at those meetings, results of steady state analysis of benchmarks and 3 preliminary alternatives were presented. These meetings had two purposes. First was to provide information about what was being done. And second, was to provide those who participated in the social impact analysis procedure background information from which they would be working in all day sessions that followed. (See Appendix F for details on the all day sessions.)

Following analysis of benchmarks and preliminary alternatives using the final FORPLAN model, a summary of results was mailed to all on the Forest Plan mailing list. In addition, a press conference was called where the general planning process was presented as were results of benchmark and preliminary alternative analysis. At that time, the public was invited to inspect all results, maps, and input to the final FORPLAN model.

Many individuals including representatives of the press came in to review this material. As part of this effort, a group of people representing jointly local citizens, the Greater Yellowstone Coalition and the Sierra Club spent a

Table B-3

Forest Related Population, Employment and Income Impacts

	Population	Personal Income (Million Dollars)	Property Income (Million Dollars)	Total Income (Million Dollars)	Employment	Unemployment (Percent)
Fremont Economic Impact Area						
Total	33,637	108.99	69.	177.99	9516	4.00
Forest Related (1977 Base)	429	2.28	1.44	3.73	284	—
Changes from Forest Related Base by Benchmark (1990 Index Year)						
1	-429	-2.21	-1.40	-3.63	-285	+1.66
2	+887	+2.49	+1.57	+4.05	+318	-.68
3	+755	+2.13	+1.34	+3.46	+278	-.64
4	+755	+2.13	+1.34	+3.46	+278	-.64
5	+499	+1.54	+1.04	+2.57	+195	-.54
6	+917	+2.55	+1.61	+4.15	-326	-.67
7	+957	+2.59	+1.58	+4.15	+338	-.68
8	+452	+1.24	+0.66	+1.89	+172	-.44
9	+806	+2.36	+1.45	+3.8	+294	-.66
10	+733	+2.09	+1.30	+3.37	+271	-.64
11	+944	+2.64	+1.67	+4.3	+335	-.68
12	+1274	+3.6	+2.34	+5.93	+431	-.71
13	+745	+2.1	+1.31	+3.4	+274	-.64
14	+836	+2.36	+1.49	+3.84	+303	-.67
15	+121	+0.25	+0.05	+0.29	+53	-.18
16	+729	+2.03	+1.17	+3.18	+267	-.61
17	+822	+2.32	+1.48	+3.78	+299	-.66
18	+400	+1.18	+ .55	+1.56	+148	-.57

Table B-3 (Continued)

Forest Related Population, Employment and Income Impacts

	Population	Personal Income (Million Dollars)	Property Income (Million Dollars)	Total Income (Million Dollars)	Employment	Unemployment (Percent)
Park Economic Impact Area						
Total	12.600	70.28	108.1	178.3	6701	3.84
Forest Related (1977 Base)	246	2.48	1.57	4.06	290	—
Changes from Forest Related Base by Benchmark (1990 Index Year)						
1	-246	-2.47	-1.57	-4.05	-327	+2.8
2	+588	+2.74	+1.88	+4.6	+352	-.58
3	+492	+2.22	+1.52	+3.73	+295	-.50
4	+492	+2.22	+1.52	+3.73	+295	-.50
5	+384	+1.65	+1.26	+2.9	+236	-.48
6	+571	+2.66	+1.82	+4.46	+342	-.57
7	+640	+2.93	+1.92	+4.84	+376	-.54
8	+382	+1.58	+0.95	+2.52	+224	-.31
9	+518	+2.42	+1.59	+4.00	+309	-.50
10	+474	+2.09	+1.41	+3.49	+284	-.48
11	+628	+2.95	+2.01	+4.94	+373	-.57
12	+761	+3.66	+2.52	+6.17	+445	-.60
13	+482	+2.17	+1.47	+3.63	+289	-.48
14	+568	+2.63	+1.81	+4.42	+341	-.57
15	+10	+0.19	+0.02	+0.20	-14	+.26
16	+469	+2.06	+1.25	+3.3	+276	-.40
17	+528	+2.43	+1.69	+4.11	+318	-.56
18	+336	+1.27	+0.74	+2.16	+208	-.49

considerable amount of time reviewing these materials. As part of this effort, they were provided a set of analysis area maps and FORPLAN input detailing all prescriptions developed for each analysis area. They were also provided a list of all of the prescriptions selected by analysis area for the Amenity benchmark. After review of this material, they provided input on a analysis area by analysis area basis of changes they would like to see in the prescriptions selected for the amenity benchmark. This input was used as an integral part of development of Alternative C - non-commodity emphasis alternative. Beyond this, input from others concerning minor changes in prescriptions was considered before prescriptions to be used in formulation of alternatives were finalized.

FORMULATION OF ALTERNATIVES

INTRODUCTION

An alternative is composed of a selected set of coordinated practices (a FORPLAN prescription) for each analysis area. The choice of each FORPLAN prescription is based on meeting the intent of the alternative in a cost efficient manner. The purpose of each alternative is to provide a coordinated forestwide response to issues, concerns and opportunities. The results of this choice for each alternative is displayed on maps using Management Areas as discussed in the previous section. Formulation of alternatives is guided by requirements of 36 CFR 219.12f(1)-(9):

1. Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect to the extent practicable the full range of major commodity and environmental resource uses and values that could be produced from the Forest. Alternatives shall reflect a range of resource outputs and expenditure levels.

2. Alternatives shall be formulated to facilitate analysis of opportunity costs and of resource use and environmental trade-offs among alternatives and between benchmarks and alternatives.

3. Alternatives shall be formulated to facilitate evaluation of the effects on present net value, benefits, and costs of achieving various outputs and values that are not assigned monetary values but that are provided at specified levels.

4. Alternatives shall provide different ways to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process.

5. Reasonable alternatives which may require a change in existing law or policy to implement shall be formulated if necessary to address a major public issue, management concern, or resource opportunity identified during the planning process (40 CFR 1501.7, 1502.14(c)).

6. At least one alternative shall be developed which responds to and incorporates the RPA Program tentative resource objectives displayed in the Regional Guide.

7. At least one alternative shall reflect the current level of goods and services provided by the Forest and the most likely amount of goods and services expected to be provided in the future if current management direction continues. Pursuant to NEPA procedures, this alternative shall be deemed the "no action" alternative.

8. Each alternative shall represent to the extent practicable the most cost efficient combination of managmenet prescriptions examined that can meet the objectives established in the alternative.

The process used to develop alternatives included the following steps:

- Issues, concerns and opportunities were identified. (See Appendix A)

- After grouping issues, concerns, and opportunities into sets dealing with the same problem area, a planning problem was specified for each set. Part of this specification was identification of a forest condition that if achieved and maintained on some part of the Forest would resolve the problem.

- These forest conditions were examined to identify similarities. When possible, forest conditions were combined into complete forest condition specifications. These complete statements are called Goals. In this way, each goal represents the solution to a multiple-use mix of planning problems and directly addresses resolution of many issues, concerns, and opportunities.

- Each analysis area was carefully examined to identify the forest conditions that could be achieved on that analysis area. This list of goals was then grouped into compatible sets that provided for management of every land type within the analysis area. Each set was then translated into one or more prescriptions. Each prescription was a carefully designed mix of specific practices, standards and guidelines developed to capitalize on efficiencies inherent in taking coordinated actions on a single area. By basing prescriptions on achievement of goals, there is a direct link between prescriptions modeled in FORPLAN and issues, concerns, and opportunities.

- A full set of prescriptions representing one or more ways of achieving every possible mix of goals for each analysis area were developed, entered into a FORPLAN model, and tested for cost efficiency in development of a full set of benchmarks and preliminary alternatives. This set and the ones selected in benchmarks and preliminary alternatives was then examined by the Forest management team and District personnel to identify if they were feasible and resolved the planning problems for which they were designed. Necessary refinements were made, and the prescriptions were developed in greater detail for the final FORPLAN model used for analysis.

- While the previous step was going on, social and economic impact analysis on the preliminary alternatives were completed. This provided input for design of final alternatives.

- The eighteen benchmarks discussed earlier were then created and analyzed as was a was a set of alternatives. Results of this analysis was then reviewed by the public, Forest management team, and District personnel. Based on this review and input from social and economic impact analysis, final alternatives were designed. This design relied heavily on benchmark results and alternatives reviewed. For example, the alternative which emphasizes production of non-commodities was developed using the non-commodity emphasis preliminary alternative, the amenity benchmark, and input provided by the Greater Yellowstone coalition working jointly with local citizens and the Sierra Club. Some of the input from these groups and from District personnel required minor adjustments to some prescriptions to increase their feasibility, cost efficiency, and bring them closer in line with solutions to issues, concerns and opportunities.

All alternatives were created using input from benchmarks so that they remained within the decision space identified by those benchmarks. All prescriptions included practices, standards and guidelines necessary for meeting coordination requirements and legal minimums. As discussed, the cost efficiency of each set of standards and guidelines was tested in steady state analysis. Thus there was assurance that all alternatives are feasible, resolve particular sets of issues, concerns, and opportunities, and meet all coordination requirements and legal minimums. Further, maximization of PNV was the objective function for all alternatives; given that all prescriptions were the most cost efficient for achieving their goals, this means that all alternatives are cost efficient for meeting goals and objectives.

Projected demand and consumptive trends were incorporated in all alternatives to insure that production levels of goods and services would not be valued above expected consumptive trend levels. Excess quantities of some goods and services, particularly dispersed recreation opportunites are produced in all alternatives due to joint production functions and the nature of use on the Forest.

From a supply standpoint, each alternative was formulated by attempting to recognize how management of the Forest related to production of goods and services by other government and private entities. Recognizing the need to correct shortfalls in local or regional suppy were important considerations in the formulation of some alternatives.

OVERVIEW OF ALTERNATIVES

Because of the way analysis was done, all of the benchmarks could be considered alternatives. They are all feasible, meet cordination requirements and legal minimums and each addresses favorably many issues and concerns. Beyond benchmarks, nine alternatives were formulated. Three of these were examined but not analyzed in detail. Each of these provided input to formulation of at least one of the six alternatives examined in detail. The three alternatives formulated but not examined in detail are:

1. District Ranger's Proposal. As prescriptions were developed for each analysis area, the Ranger and his staff identified a prescription that appeared to solve the most pressing management problems on that analysis area. This choice was independent of any forestwide management strategy and was based soley on the management problems faced on that analysis area. The purpose of this alternative was to identify the forestwide effects of these choices.

Creation and analysis of this alternative used an objective function of maximization of PNV using market and assigned values. The constraint of non-declining flow was used as was a constraint allowing only those prescriptions selected by the Ranger's to enter solution. No minimum production levels for goods and services were used as constraints. The selection of a specific prescription for an analysis area effected timber management in terms of the management emphasis allowed and at times how much timberland within an analysis area would be accessible by decade, but did not effect the selection of timberlands to be managed for timber nor the schedule of timber harvests. This was determined soley based on the objective function of maximization of PNV and non-declining flow constraint.

After all alternatives were formulated, the results of this alternative were compared with those of other alternatives. It was found that this alternative shared many caharacteristics of the current direction alternative. Further, the basic concept behind many of the prescriptions selected in this alternative were the same as some of those found in the preferred alternative. Because the major effects of this alternative were quite similar to the other two alternatives, it did not appear necessary to analyze this alternative in detail. This alternative was almost identical to the "District Needs" benchmark whose major outputs and effects were displayed earlier.

2. Preliminary Non-Commodity Empahasis Alternative. Based on analysis of benchmarks, the interdisciplinary team created this alternative to emphasize production of non-commodity goods and services. The intent of this alternative was to emphasize production of water, protection of high quality water, optimiztion of recreation, and production of wildlife forage on sutiable range.

   The objective function for creating this alternative was maximization of PNV using market and assigned values. It included non-declining flow as a constraint, a recreation GTE constraint modified to emphasize low density dispersed recreation, Wyoming Wilderness Act constraint, a constraint to force in prescriptions which increased water yields, allowed no prescriptions that posed a high risk to water quality, a wildlife forage GTE constraint, and a limit on the amount of area of moderate hazard to soil and water available for surface occupancy for oil and gas exploration and development.

   A number of iterations were necessary to identify the set of constraints and constraint levls that would be feasible. While these iterations were being done, a combined group representing the Greater Yellowstone Coalition and the Sierra Club began work on their own alternative (see the next alternative for more detail). Also, the Forest management team reviewed this alternative. This alternative shared many characteristics of the amenity benchmark and the alternative created by the Greater Yellowstone Coalition/Sierra Club. Becase of that, it was decided that this alternative would be combined with some features of the amenity benchmark and recommendations from the Greater Yellowstone Coalition/Sierra Club to develop the non-commodity alternative examined in detail.

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3. Greater Yellowstone Coalition/Sierra Club Alternative. After benchmarks were formulated and analyzed and while alternatives were being formulated, the public was notified that they could review all benchmark results, prescriptions developed for each analysis area, costs, practices, and production coefficients. Many individuals and local media did review some of this material. The Greater Yellowstone Coalition requested the opportunity to provide input in the form of an alternative that they would design. Members of the Greater Yellowstone Coalition, the Sierra Club, and people familiar with the Forest met in Dubois and then Cody with Forest personnel including members of the interdisciplinary team. Focus was on the amenity benchmark and prescriptions selected in that benchmark. This group was provided copies of all prescriptions and maps of all analysis areas. After what appears to have been a great deal of work, they provided input in terms of the prescriptions they would like to see selected for each analysis area as well as some minor modifications of those prescriptions (a typical modification was to provide a greater share of the forage produced on suitable range to wildlife on a particular analysis area than called for in the prescription they selected). The intent of this alternative appears to be an emphasis on high quality, low density dispersed recreation, protection of water quality values, and provision for increasing wildlife populations.

   This altenative was not analyzed separately in FORPLAN because of time and budgetary considerations. Rather, because it matched the intent of the non-commodity emphasis alternative, it was decided to incorporate this alternative into the non-commodity alternative examined in detail. For a detailed discussion of how this was done, see the explanation of the development of the non-commodity emphasis alternative examined in detail (Alternative C).

ALTERNATIVES EXAMINED IN DETAIL

Six alternatives were formulated and examined in detail. These represent a range of reasonable funding levels and a wide range of production levels for various goods and services. Formulation of all alternatives met prescribed analysis procedures and requirements of the National Forest Management Act and its regulations (36 CFR 219). All significant costs and benefits were included in analysis and effected selection of prescriptions and schedules of activities. All alternatives were analyzed to assure that they could be implemented as presented in this document and that they were cost-efficient.

One of the major issues facing the Forest is oil and gas exploration and development. Because of this, a procedure was developed to incorporate oil and gas considerations in selection of prescriptions for each alternative. This procedure was based on a procedure developed by the Rocky Mountain Oil and Gas Association (RMOGA) and was modified to meet the prescribed procedures for analysis and Forest Planning. Represetatives of RMOGA reviewed this procedure as did Forest Service personnel in the Regional Office. Based on Regional Office review, it was felt that the procedure was too experimental and data too sparse to include as part of the analysis of alternatives, but could be added in later stages of analysis and displayed as part of the consequences for each alternative. The results of analysis of each alternative in terms of considerations for oil and gas exploration and development, and the PNVs reported for each include the lease values developed using the experimental procedure and data are presented in Appendix D.

Constraints common to all alternatives examined in detail include meeting non-declining timber flow policy and meeting the provisions of the Wyoming Wilderness Act.

Alternative A - Current Direction Alternative. This alternative is designed to show the effects of managing the Forest using the goals and objectives of existing plans and policies. This forms a basis for comparing all other alternatives and their ability to solve management problems. It also serves as the no action alternative.

Alternative B - Commodity Emphasis Alternative. This alternative is designed to emphasize production of commodity goods and services. These include timber, forage for domestic livestock, developed recreation, and the least possible restrictions for oil and gas exploration and development. This alternative responds to issues and concerns regarding the ability of the Forest to support local dependent industries, have a high positive impact on local economies, and provide for oil and gas exploration and development in the least restrictive manner possible without threatening soil and water minimums. This latter consideration has local impacts in terms of the economic support oil and gas industries provide to local economies as well as national needs for energy self-sufficiency.

Alternative C - Non-Commodity Emphasis Alternative. This alternative was designed to emphasize production of non-commodity goods and services. This includes an emphasis on high quality dispersed recreation, high quality habitat for wildlife, increased water yield, hunting and fishing and enhanced water quality. This alternative was developed in response to issues and concerns related to preservation of the rugged scenic beauty of the Forest, enhancement and protection of the greater Yellowstone ecosystem, and increasing opportunities for solitude and wildlife viewing. It was developed based on the amenity benchmark, a preliminary non-commodity alternative and input from local citizens inconjunction with the Greater Yellowstone Coalition and the Sierra Club.

Alternative D - Preferred Alternative. The intent of this alternative was based on results of benchmark analysis, economic impact analysis, and social impact assessment. In the spring of 1984, a series of meetings was held in Cody, Dubois, and Lander. These meetings were designed to provide data on possible social impacts of Forest Plan Alternatives. Results from these meetings showed that polarization in local communities appeared to decrease as alternatives moved from a commodity emphasis toward and amentity emphasis. However, the intensity of that polarization was at a minimum at some point in between the extremes of total commodity vs. total non-commodity. From this analysis it appeared that an alternative that produces some commodities but emphasizes production of non-commodity goods and services would have a beneficial social impact.

Economic impact analysis had been done on preliminary alternatives. A great many changes have occured in local economies in the last 2 to 3 years; most of them detrimental. Mines have closed permanently; oil and gas production, one of the major inputs to economies, have dropped off; and sawmills have closed periodically. From economic impact analysis it appeared that production of commodities at or above current levels would be beneficial to local economic systems. It also indicated that continued production of high quality dispersed recreation opportunities including hunting and fishing were important to local economies.

In benchmark analyses, particularly the maximum PNV benchmark, it appeared that production of commodity goods and services at levels slightly higher than current were economically efficient. It also indicated that a pure emphasis on such goods and services as wildlife forage and amentities lowered production of commodity goods and services, but in some cases not dramatically.

Based on the combined results of these analyses, the Forest management team selected a philosophy for the preferred alternative. This was to attempt to produce commodity goods and services at existing levels while emphasizing production of non-commodity goods and services. Because prescriptions developed for FORPLAN were multiple-use mini-plans for each analysis area that attempted to capture joint production capabilities of forest ecosystems, this philosophy appeared to be a viable one that could be analyzed as part of Forest Planning.

Reduced Budget Alternative. This alternative was created to examine the effect of reducing the Forest budget by 25% from the fiscal year 1982 budget. Effects of the "Reduced Budget" benchmark were used to help formulate this alternative.

RPA Alternative. This alternative was formulated to examine and display the effects of meeting production levels as assigned to the Forest through the Regional Guide as part of the National RPA Program. All RPA targets were within the Forest's capabilities and were used to formulate this alternative.

Use of Benchmark Results in Formulation of Alternatives.

Benchmarks were designed to investigate the Forest's potential to resolve problems identified by issues, concerns and opportunities. Results from benchmarks were displayed earlier as was the range of production levels for major goods and services. This range of production levels, sometimes referred to as the decision space, was used to help define levels for goods and services to be produced by each alternative based on the intent of the alternative. Constraints used to represent desired levels of production for each alternative are discussed by good or service.

Timber. Timber production potential on the Forest is limited. This is due to such factors as steep terrain, poor moisture regimes, wide variations in temperature, low productivity soils and the fact that over 50% of the Forest is wilderness. Because of these factors, the range of possible timber production levels is small relative to most other National Forests. Possible average annual harvests for the first 10 years can vary between 0 MMBF and 16.9 MMBF if a moderate departure is allowed. If non-declining flow is imposed as a constraint, this range narrows to between 0 MMBF and 14.8 MMBF. Based on preliminary analysis, a departure from non-declining flow did not appear to be warrented. Constraints were used to analyze a range of 3 MMBF to 13 MMBF within alternatives:

> Alternative A. A timber constraint representing the average annual timber cut and sold over the last 10 years was used as a minimum production level. For this, the constraint was 8.0 MMBF ; timber production in the first decade exceeded this level, so this constraint had no effect on the solution. No opportunity cost can be attributed to this constraint.

Alternative B. To emphasize commodities, a constraint near the maximum amount of timber that could be produced was used. This constraint was 13 MMBF. This constraint did effect the solution and lowered PNV for this alternative when compared with the max PNV benchmarks.

Alternative C. The first decade timber production level from the amenity benchmark of 8.3 MMBF was used as a maximum production level constraint for the non-commodity emphasis alternative. This appeared to fit the intent of this alternative. This production level was lower than the level produced without such a constraint and lowered PNV when compared with the max PNV benchmark.

Alternative D. Early iterations in formulation of this alternative had the same timber production minimum as in the current direction alternative. As in the alternative A, it was found that this constraint did not effect the solution, so in final FORPLAN analysis of this alternative no constraint on production of timber was used.

Alternative E. The reduced budget benchmark produced no timber. This did not appear to be viable for an real alternative; so a minimum level of timber production of 3.0 MMBF was used in formulation of this alternative. This constraint did effect the solution and lowered PNV slightly when compared with the reduced budget benchmark.

Alternative F. The R.P.A. timber target was used as a minimum production level for timber in this alternative. This constraint was 10 MMBF for the first decade and 11 MMBF for decades 2 through 5. This constraint affected the solution in the first 2 decades, but the effect in changes in PNV were negligable.

Range. Range production possiblities on the Forest are limited. Only about 12% of the the Forest is suitable for grazing domestic livestock. The possible production levels range between 0 AUMS and 96.9 MAUMS. The range of AUMS produced in alternatives was 40.9 MAUMS to 87.38 MAUMS. Constraints by alternative are as follows.

Alternative A. No constraint was used for AUM production in formulation of this alternative.

Alternative B. A constraint of 70. MAUMs as a minimum for forage available for cattle and a maximum of 10 MAUMS as a maximum for forage available for domestic sheep were used in formulation of this alternative. Niether of these constraints appears to have effected the solution in FORPLAN analysis of this alternative.

Alternative C. No constraint was used for AUM production in formulation of this alternative.

Alternative D. In iterations during formulation of this alternative, constraints requiring a minimum of cattle forage of 78.3 MAUMs and 74. MAUMs was used with another constraint placing a maximum of 10 MAUMs on forage for domestic sheep. Through the iteration process, it was found that these constraints were not necessary. No such constraints were used in the final FORPLAN analysis of this alternative.

Alternative E. No constraint was used for AUM production in formulation of this alternative.

Alternative F. No constraint was used for AUM production in formulation of this alternative.

Recreation. The Forest has a much higher capacity for production of recreation experiences than will be used for all types of recreation with the possible exception of down-hill skiing. To model recreation in a way that attempted to portray what would actually occur, recreation use rather than capacity was estimated. Formulation of alternatives focussed on use levels desired for each alternative by recreation type. To further refine analysis, these desired use levels were broken out by District. The basis for design of such constraints were the constraints by recreation type by District developed for the optimum recreation benchmark. Such constraints were used in formulation of four alternatives. These constraints are intertwining in their effect on solutions making real analysis of the effects of any single constraint impossible. Thus they are discussed as a set of constraints. The major effects of this set of constraints can be discerned by examining the differences between benchmark 4 and the optimum recreation benchmark. The only difference in the formulation of these two benchmarks is this set of constraints. The PNV difference between these two benchmarks is $14 million or a drop of about .5%. The effects on PNV of this set of constraints for any alternative is always less than this because the entire set of constraints was never used in its complete form.

Alternative A. No constraints on recreation production were used in the formulation of this alternative. Recreation, like other uses, is embedded in each FORPLAN prescription; thus recreation produced in this alternative was based on the recreation management and opportunites embedded in current direction.

Alternative B. In conformance with the intent of this alternative, the developed recreation portion of the optimum recreation constraints was used as a constraint. This produced slightly more developed recreation than benchmark 4; but because of the joint effects of these constraints with those included for range and timber, it is impossible to determine if these were the cause of a lower PNV.

Alternative C. In early iterations of this alternative, the set of optimum recreation constraints was modified to formulate this alternative. The modifications are discussed later, but entailed a slight altering of the mix of recreation opportunities to be produced in the first decade by District to favor low density dispersed recreation.

Alternative D. Again the set of optimum recreation constraints was used in early iterations while this alternative wa being formulated. In this case, this set of constraints was modified on a District by District basis to provide both developed and dispersed recreation near optimum levels.

Alternative E. No levels for recreation production were used as constraints for formulation of this alternative.

Alternative F. As in the commodity alternative, the developed recreation portion of the optimum recreation constraints were used to formulate this alternative.

Those were the major constraints used to represent production levels for goods and services for all alternatives. Table B - displays all constraints used in formulation of alternatives. These are referred to as standard constraints and are discussed next.

As stated, constraints were used to instruct FORPLAN as to the intent of each alternative. These constraints fell into 18 catagories as described below.

1. Creation of some alternatives appeared to require that there be a minimum amount of timber produced. This constraint is referred to as a Forestwide Timber Greater than or Equal (GTE) constraint and it sets the minimum for timber production for the first decade when used. It was only used for the commodity emphasis alternative and the R.P.A. alternatives.

2. The Forest serves two separate and distinct timber markets. Some alternatives had the intent of meeting minimum production levels for these markets. This required a constraint for the minimum timber to be produced in the first decade by market area. This constraint is referred to as the timber north and south GTE constraint. It was used for the current direction, preferred and reduced budget alternatives.

3. Production of recreation opportunities at the highest projected consumption levels for each type of recreation was important for some alternatives. For this, constraints developed for the optimum recreation benchmark were used. At times, these had to be modified to meet the intent of a specific alternative. These constraints are referred to as Recreation by ROS by District GTE constraints. They were used for the preferred, commodity emphasis, R.P.A., and non-commodity emphasis alternatives.

4. Some alternatives were designed to produce forage for cattle at or above specified levels. This constraint is referred to as Cattle AUMs GTE constraint and was used for the preferred and commodity emphasis alternatives.

5. Some alternatives included the objective of producing a minimum amount of forage for domestic sheep. This constraint is referred to as Sheep AUMs GTE constraint and was used in the formulation of the proposed and commodity emphasis alternatives.

6. Formulation of alternatives began before the Wyoming Wilderness Act was signed into law. Thus early development of some alternatives included variations in how the Dunoir Special Management Unit would be treated. All final alternatives were constrained to protect the wilderness character of the entire 28,800 acres of this special management unit. This constraint is referred to as Dunoir 28,800.

7. To make all alternatives consistent with the Wyoming Wilderness Act, a set of constraints referred to as the Wyo. Wilderness Act constraint was used in all alternatives.

8. In order to develop the reduced budget alternative, there was the need to place a constraint on the maximum budget allowed. This constraint is referred to as the Budget less than or equal (LTE) constraint.

9. To create the R.P.A. alternative, it was necessary to establish a minimum on revenues generated by management. This constraint is referred to as the Revenue GTE constraint.

10. Each prescription carried an identifier as to whether or not it provided for active management to increase water production (e.g. snow fencing or 5 to 10 acre clear cuts to enhance water yield). This type of activity was necessary to meet the intent of the non-commodity emphasis alternative. A constraint to select these prescriptions where appropriate was used for this alternative and is referred to as the Water Improvement Rxs constraint.

11. Because of the types of land within an analysis area there was a high risk of water quality degredation given the practices, standards, and guidelines within some prescriptions for that analysis area. Standards and guidelines were written to protect soil and water minimums, but in some prescriptions these were relaxed to the very minimum resulting in a risk of short term water quality degredation if there was a mishap particularly in oil and gas development activities. The intent of some alternatives was to reduce this risk. Each prescription was identified as to whether or not it posed a high risk. A constraint was developed which eliminated these prescriptions from being considered based on the intent of the alternative. This constraint is referred to as No Rxs with Highest Risk. This constraint was used all or in part in formulation of the preferred and non-commodity emphasis alternatives.

12. In formulation of the non-commodity emphasis alternative, a minimum amount of wildlife forage from suitable rangelands was desired. To accomplish this, the Wildlife Forage GTE constraint was used.

13. One of the inventory items for each analysis area was the number of acres of land where surface occupancy for oil and gas exploration and development would pose a moderate hazard to soil and water resources (criteria for this is in planning records). Based on the way prescriptions were developed, a handle on prescriptions that favored non-commodities was the amount of land having a moderate hazard for surface occupancy that would be allowed forestwide. A constraint referred to as Limit Moderate Hazard LTE constraint was developed and used in early development of the preferred alternative and the non-commodity emphasis alternative.

14. As prescriptions were finalized, each Ranger identified the prescription for each analysis area that appeared to solve his management problems on that analysis area. Again each of these were labled as the District's preference. In order to analyze the forestwide effects of optimizing solutions to problems on an analysis area by analysis area basis, a constraint was developed which allowed only those prescriptions so identified to be selected. This constraint is referred to as District Preference Rxs. This constraint was used to develop the District Alternative.

15. Development of the preferred alternative required many iterations and some refinements to prescriptions. The final set of prescriptions selected for this alternative were given an identifier. In order to tabulate the forestwide effects of this alternative, a constraint was needed to allow only those prescriptions with this identified to be selected. This is referred to as the Proposed Rxs constraint.

16. Development of the non-commodity emphasis alternative followed the same patterns as development of the preferred. Again prescriptions were given an identifier to identify them as candidates for this alternative. A constraint referred to as the Non-commodity Rxs constraint was used to allow only those prescriptions carrying this identifier to be considered in the final development of this alternative.

The use of these constraints is summarized in the following table. As can be seen on this table, most alternatives required a small subset of these 18 sets of constraints.

Use of Constraints on Prescriptions

Breaking FORPLAN analysis in stages as done on the Forest is much different than standard analysis procedures used in many other Forest Planning efforts. This process provided the capability to design and analyze very site specific multiple-use "mini-plans" or prescriptions for each analysis area. In this way, esitmates of costs, production levels, environmental effects, and determination of appropriate standards could be tailored to the specifics of an analysis area. Also multiple-use effects of each practice could be estimated and captured in the model. This appears to have increased the site specificity of this planning effort and provides detailed direction by analysis area for implementation.

A full range of prescriptions was analyzed at steady state to identify those that resolved issues, concerns and opprotunities in a cost efficient way. This included an analysis of alternative standards, mixes of practices, and mixes of management goals on each analysis area. The set of prescriptions identified at this level of analysis were then examined carefully by the interdisciplinary team, the management team, and members of the public. This examination focussed on the feasibility and implementability of prescriptions as well as the range of prescriptions. From public comment on prescriptions so developed and from review by Forest personnel, the conclusion was that a full range of prescriptions is available for management of all analysis areas and that the prescriptions can all be implemented.

Prescriptions in the final FORPLAN model were cost efficient, coordinated multiple-use plans for each analysis area. Each prescription was designed carefully to resolve a specific set of issues, concerns and opportunities on a specific analysis area. And each had been reviewed for implementability using on-the-ground experience and knowledge.

As alternatives were formulated, standard analysis procedures were followed. That is, a set of constraints on outputs and/or effects was placed on the FORPLAN model and the model was run with a maximum present net value objective

TABLE B-4

Standard Constraints *

Constraint	A Current	B Commodity	C Nncmmdty #1-6	C Nncmmdty #7	D Proposed #4	D Proposed #5	E Reduced Budget	F RPA
Forestwide Timber GTE	N	13MMBF	N	N	N	N	N	10MMBF(1) 11MMBF(2-5).
Timber North and South GTE	3.5N 4.5S	N N	N N	N N	3.5N 4.5S	3.5N 4.5S	N 2S	N N
Recreation by ROS by District GTE	N	Developed Only	Modified	N N	N Y	d N	N	Developed Only
Cattle AUMs GTE	N	Y	N	N	Y	N	N	N
Sheep AUMs GTE	N	Y	N	N	Y	N	N	N
Dunoir 28,8000	Y	Y	N	Y	N	Y	Y	Y
Wyoming Wilderness Act	Y	Y	Y	Y	Y	Y	Y	Y
Budget LTE	N	N	N	N	N	N	Y	N
Revenue GTE	N	N	N	N	N	N	N	Y
Water Improvement Prescriptions	N	N	Y	N	N	N	N	N
No Prescriptions with Highest Risk	N	N	Y	N	Modified	N	N	N
Wildlife Forage GTE	N	N	Y	N	N	N	N	N
Limit Moderate Hazard GTE	N	N	Y	N	Y	N	N	N
District Preference Prescriptions	N	N	N	N	N	N	N	N
Proposed Prescriptions	N	N	N	N	N	Y	N	N
Noncommodity Prescriptions	N	N	N	Y	N	N	N	N

A "Y" in a column means the constraint was used. A "N" in a column means the constraint was not used.

function. Following this, all prescriptions that were chosen by FORPLAN were identified by analysis area by alternative. This list was then examined by the interdisciplinary team and then the Forest management team. Focus of this examination was to:

identify if the prescriptions chosen using this analysis process conformed to the intent of the alternative;

check management of neighboring analysis areas to see if the choices of management prescriptions for adjoining areas provided a coordinated management strategy for that portion of the Forest and made sense from an on-the-ground management standpoint;

and based on a better understanding of the intent of the prescription, to identify if there were needs to make minor changes (e.g. instead of 2 water developments for cattle, perhaps 3 are needed) to prescriptions to assure their feasibility, bring them into conformance with the intent of the alternative, and enhance the joint production capabilities of included practices.

This was done for all alternatives. In the case of Alternatives B, E, and F, there was no need to make any adjustments in prescriptions nor any need for substitutions of prescriptions chosen by FORPLAN for each of these alternatives.

Final formulation of Alternatives A, C, and D included constraints on prescriptions to be chosen by FORPLAN. In the case of alternative A, only one prescription developed for each analysis area captured current direction. The easiest way to formulate this alternative, then, was to place a constraint on the final FORPLAN model that only those prescriptions representing current direction could be selected. This was consistent with the intent of this alternative; i.e. to identify the costs, probable production levels of goods and services, and effects of managing under current directions, plans and policies.

Formulation of alternatives C and D followed a slightly different path. As discussed in the next section, a number of iterations were made in formulation of these two alternatives. These iterations followed the standard analysis procedure of using constraints to represent the intent of these alternatives. In each case, the final iteration yielded an infeasible solution. The infeasibility amounted to the inability of FORPLAN to identify a prescription that met the intent of the alternative for the Greybull analysis area. This analysis area has a high potential for oil and gas development and a high concentration of erodable soils on steep terrain. Prescriptions that met the intent of these alternatives in terms of oil and gas development, could not meet the intent of these alternatives in terms of the recreation mix produced nor the intent for emphasis on enhancement of wildlife habitat and water quality. In this case, a prescription that came closest to meeting all concerns and the intent of these alternatives was modified. The major modification was to specify the types of operating standards for oil and gas exploration and development that would be recommended given that prescription. This did not effect the PNV of the prescription except when run using the experimental oil and gas valuation procedure. Even in this case, the change in PNV was insignificant in terms of forestwide PNV.

All prescriptions that were chosen by FORPLAN for alternatives C and D were examined as outlined above. In the case of these two alternatives, this examination turned up some minor problems in terms of meeting the intent of the alternative while simultaneously providing for coordinated management of adjoining areas. To remedy this, minor changes in less than 20 prescriptions for both alternatives were made based on direction from the Forest management team. In all cases, these changes did not effect PNV of effected prescriptions to the point that the choice of prescription would change to a different prescription for that analysis area.

To tabulate the costs, output levels, and effects modeled in FORPLAN, a final run was made for each of these alternatives. As in the case of alternative A, the major constraint on these runs was specification of the FORPLAN prescription or set of prescriptions that would be allowed for each analysis area. The effects of these constraints are displayed in Table B-5 for alternative D in terms of changes in PNV from the prescription chosen for each analysis area in these alternatives and the prescription chosen in benchmark 4. This table displays analysis of the present net value of each FORPLAN prescription on each analysis area. The numbers in the table are higher than when the Forest-wide total is considered because demand cut-offs do not operate on individual analysis areas independent of other analysis areas. The reduction in PNV is actually much less than shown in Table B-5 due to demand cutoffs operating both on Benchmark 4 and the Preferred Alternative. The true reduction in PNV due to the preferred prescription constraint is shown in Table B-7.

Following this procedure for all alternatives provided assurance that all probable and proposed actions met the intent of the alternatives and that each alternative was feasible. This plus all prior analysis assured that each alternative also included the most cost efficient set of practices and standards to meet the intent of that alternative.

Following is a brief discussion of how each alternative was formulated.

Alternative A - Current Direction Alternative

This alternative is designed to show the effects of managing the Forest using the goals and objectives of existing plans and policies. This forms a basis for comparing all other alternatives and their ability to solve management problems. It also serves as the no action alternative.

As prescriptions were refined by District personnel, a prescription was developed which embodied current direction. Creation of this alternative included a constraint that allowed only prescriptions identified as current direction prescriptions to be selected.

A second set of constraints was used to assure that a minimum amount of timber be produced in each market area served by the forest. The minimum set for the northern 3 Districts was 3.5 million board feet and for the southern 2 districts the minimum was set at 4.5 million board feet. These represented an amount of timber close to the amount actually sold and harvested over the last 10 years. This set of constraints had no apparent effect on the PNV of the alternative for the amount of timber produced exceeded the constraints.

Common constraints were also added to meet the provisions of the Wyoming Wilderness Act.

An objective function of maximization of PNV using both market and assigned values was used.

The effect of this group of constraints on PNV is depicted by the total change in PNV between this alternative and the maximum PNV benchmark.

Alternative B - Commodity Emphasis Alternative

This alternative is designed to emphasize production of commodity goods and services. These include timber, forage for domestic livestock, developed recreation, and the least possible restrictions for oil and gas exploration and development. This alternative responds to issues and concerns regarding the ability of the Forest to support local dependent industries, have a high positive impact on local economies, and provide for oil and gas exploration and development in the least restrictive manner possible without threatening soil and water minimums. This latter consideration has local economic impacts in terms of the support oil and gas industries provide to local economies as well as national importance in terms of energy self-sufficiency.

Constraints common to all alternatives were used in this alternative. These are non-declining flow for timber and meeting the provisions of the Wyoming Wilderness Act.

An additional constraint was used to place a minimum on the production of timber in the first decade. This was a forestwide minimum of 13 million board feet. This level was within the maximum identified in the benchmarks, was significantly higher than the average timber sold and cut in the last ten years, and was within the mill capacity of local mills. This constraint was necessary to meet the intent of this alternative to emphasize production of commodity goods and services.

Another constraint placed a minimum on AUMs for domestic cattle. This level was 70,000 AUMS. This was within the maximum identified in benchmarks, was greater than existing permitted AUMs, and approximated the amount produced in the maximum PNV benchmarks. Like the production minimums for timber, this minimum was included as a constraint in order to meet the intent of this alternative.

A similar minimum on AUMs for domestic sheep was used as a constraint. This level was 33,000 animal months. Again this represented a level within the maximum identified in benchmarks, and was higher than current use.

To emphasize production of developed recreation, the constraint set for developed recreation in the optimum recreation benchmarks was used. This represented the maximum developed recreation that could be consumed, on average, for the first decade.

This alternative was created using an objective function of maximization of PNV. These constraints were often overlapping in their effect so an accurate picture of their effect can only be done in aggregate as depicted in the following tables.

TABLE B-5

Effect of Prescription Constraint on Present Net Value (Thousand Dollars)

	Benchmark #4		Preferred Alternative	
Analysis Area Number	FORPLAN Prescription Selected	Contribution to PNV (Market plus Assigned)	FORPLAN Prescription Selected	Reduction in Contribution to PNV
001	1A	42,113	1A	0
002	3M	138,643	3M	0
003	1A	85,316	1A	0
004	1M	55,637	1M	0
005	3A	19,293	3A	0
006	1A	22,042	1A	0
007	7A	41,578	7A	0
008	7A	15,864	1A	2,789
009	2R	25,255	2R	0
011	1R	52,982	1R	0
013	7M	38,918	7M	0
016	3A	6,127	3A	0
018	4A	22,178	6A	181
019	2A	31,019	2M	6,022
020	4A	261,477	4A	0
021	2A	136,878	4M	0
022	3A	22,472	4A	8,629
023	4A	13,401	4A	0
024	3A	35,104	3A	0
025	1A	9,939	1M	49
026	1A	18,643	1B	248
040	6A	38,181	1A	171
042	2B	28,447	3M	615
043	1M	71,520	3A	8,706
045	1A	45,200	8A	14,700
046	3B	13,357	3B	0
047	4A	2,406	2M	981
048	4A	1,653	1A	0
049	1A	22,275	7R	7,033
051	3A	11,522	1A	0
052	4M	22,673	4M	0
054	6A	5,573	2A	22
055	6A	18,709	2A	7,426
056	4A	61,253	3M	290
057	4A	14,757	4A	0

TABLE B-5 (Continued)

Effect of Prescription Constraint on Present Net Value (Thousand Dollars)

	Benchmark #4		Preferred Alternative	
Analysis Area Number	FORPLAN Prescription Selected	Contribution to PNV (Market plus Assigned)	FORPLAN Prescription Selected	Reduction in Contribution to PNV
058	4B	21,405	4B	0
059	2A	46,251	2A	0
061	2M	9,823	2A	71
063	1A	22,014	1M	5,315
072	3A	52,405	1A	1,637
073	2A	16,555	1A	4,485
074	4A	19,875	4A	0
075	1A	5,411	3A	1,092
076	1A	25,494	1A	0
077	2A	46,606	2A	0
091	7A	10,435	3M	513
092	8A	38,026	8A	0
094	7B	22,982	7B	0
095	3A	18,492	3A	0
097	3A	4,171	3A	0
098	8M	39,142	8M	0
099	3M	7,102	3M	0
100	8A	16,962	8M	197
101	2B	464	1A	38
102	6B	6,229	3A	0
103	7M	34,249	7M	0
104	2A	43,622	1A	0
105	3A	11,929	2A	0
106	3A	25,810	3A	0
108	0A	3,650	2A	165
109	1B	1,554	2A	85
110	4A	68,862	2A	0
111	3A	77	2A	154
112	1A	1,387	1A	0
113	5A	22,127	5A	0
114	3B	1,477	2A	152
115	5A	20,249	5A	0
117	1A	57,934	2A	0
118	1A	77,284	1A	0

TABLE B-5 (continued)

Effect of Prescription Constraint on Present Net Value (Thousand Dollars)

	Benchmark #4		Preferred Alternative	
Analysis Area Number	FORPLAN Prescription Selected	Contribution to PNV (Market plus Assigned)	FORPLAN Prescription Selected	Reduction in Contribution to PNV
131	1A	31,937	3B	7,510
132	1M	35,377	7A	3,715
134	6A	23,884	1M	0
135	1A	38,667	2A	13,455
137	7A	4,291	7A	0
140	1A	9,935	3M	3,612
143	1M	26,340	3M	5,041
144	3A	2,314	3A	0
146	5A	9,455	5A	0
148	4A	3,592	4A	0
150	2B	71,450	7A	17,312
152	3M	27,655	3M	0
153	3A	9,092	3A	0
154	1M	33,901	7A	6,531
156	7A	4,075	7A	0
157	4A	27,774	4A	0
159	5A	259,893	4A	0
160	4B	266,887	4A	0
161	2A	189,800	4A	0
162	5A	282,656	5A	0
163	4A	1,607	1A	0
164	3A	54,714	2A	0
166	1A	212,988	3M	92,924
181	9C	91,194	9M	2,074
182	1A	32,898	1A	0
183	1A	60,759	1A	0
184	3D	60,896	3A	16,238
186	4B	26,718	4C	0
187	1C	49,779	1C	0
188	1B	36,691	1B	11,224
189	7A	14,474	7A	0
190	1A	72,058	6C	31,379
191	3C	134,738	8B	32,511
192	3M	44,755	7A	14,045
194	1A	13,679	4A	135

TABLE B-5 (Continued)

Effect of Prescription Constraint on Present Net Value (Thousand Dollars)

	Benchmark #4		Preferred Alternative	
Analysis Area Number	FORPLAN Prescription Selected	Contribution to PNV (Market plus Assigned)	FORPLAN Prescription Selected	Reduction in Contribution to PNV
195	3A	85,892	3A	0
196	1B	23,884	1B	0
197	4M	38,104	4M	0
198	4A	143,974	4A	0
199	4A	184,279	4A	0
Total		4,993,000		318,248

Alternative C - Non-Commodity Emphasis Alternative

This alternative was designed to emphasize production of non-commodity goods and services. This includes an emphasis on high quality dispersed recreation, high quality habitat for wildlife, increased water yield, hunting and fishing and enhanced water quality. This alternative was developed in response to issues and concerns related to preservation of the rugged scenic beauty of the Forest, enhancement and protection of the greater Yellowstone ecosystem, and increasing opportunities for solitude and wildlife viewing.

This alternative was developed based on the amenity benchmark, a preliminary non-commodity alternative created by the interdisciplinary team, and input from the Greater Yellowstone Coalition and Sierra Club. Development of this alternative required a great number of iterations, the more significant of which are reported here.

As prescriptions were developed, those that emphasized amenity values were identified. These were the set of prescriptions allowed to be selected in the amenity benchmark. This set of pescriptions did not include those that would increase water production and enhance summer run-off. For this reason, just use of the amenity prescriptions was discarded. Rather a complex set of constraints was used.

Iteration 1 - the following constraints were used in the first iteration:

the standard constraint to eliminate those prescriptions which posed a high risk to water quality degredation.

a constraint that established a maximum for the number of acres where oil and gas surface occupancy would pose a moderate hazard to soil and water resources. Because of the interrelationships built into the model, this constraint was used as a way to tell the model that prescriptions that favored dispersed recreation, water quality, and wildlife habitat should be emphasized when selecting a prescription for each analysis area.

a modification of the optimum recreation constraints to produce at least 90 percent of the maximum recreation that would be consumed if provided; emphasis was placed on semi-primitive and pristine recreation.

a constraint requiring increased water yield prescriptions where appropriate. This constraint was necessary to increase water production because these options were never selected on a purely cost efficiency basis.

a constraint requiring production of at least 90,000 wildlife months of forage production on rangeland suitable for domestic livestock. Maximum PNV benchmark did not produce this many wildlife months, therefore it was felt that this constraint was needed to capture the intent of the alternative to favor non-commodity production.

the common constraint requiring conformance with the Wyoming Wilderness Act except for management of the Dunoir Special Management Unit.

a constraint that called for managing 11,100 acres of the Dunoir Special Management Unit for wilderness and the remaining 17,700 acres of the unit for dispersed non-motorized recreation and wildlife. It was felt that management of these lands would eleviate a current management problem of over use of rangeland in the spring and fall by herds migrating through this area. This appeared appropriate given the intent of this alternative.

and the constraints common to all alternatives of non-declining flow for timber.

an objective function of maximization of PNV using both market and assigned values was used as in all alternatives.

This run proved to be infeasible. Prescriptions which provided for increased water production and active management of forage for wildlife appeared to not produce the desired mix of recreation.

Iteration 2 - In iteration 2, the same amounts of recreation by recreation opportunity were required, but in different locations on the Forest. All other constraints remained the same.

This run proved to be infeasible. In this case, there appeared to be a conflict between the recreation opportunities desired and the total amount of moderate hazard land on which surface occupancy would be allowed.

Iteration 3 - In iteration 3, the amount of semi-primitive motorized recreation constraint for the Greybull District was relaxed from 7800 RVDs to 6000 RVDs. Also the upper limit on the amount of moderate hazard lands on which surface occupancy would be allowed was increased from 225,000 acres to 230,000 acres.

This run proved infeasible. The reason for the infeasibility appeared to be the upper limit on surface occupancy on moderate hazard lands.

Iterations 4, 5, & 6 involved juggling of desired recreation mixes by District and incremental raising of the amount of moderate hazard land available for surface occupancy for oil and gas operations.

Iteration 6 had a single infeasibility in it and that dealt with the inability of the model to find a prescription for a single analysis area that would meet the requirements for producing a specific mix of recreation without allowing surface occupancy on too many acres. Iteration 6 was the last iteration in formulation of the preliminary non-commodity alternative.

By the time new constraints were developed for a seventh iteration, input from the Greater Yellowstone Coalition and Sierra Club was submitted. It was decided at that time to combine this input with what had been learned in the preceding six iterations. This involved identifying the prescriptions requested by analysis area by this group and making minor modifications when such modifications were within the scope of the original prescription. This did not provide a prescription for each analysis area. The next step was to check the amenity benchmark for those analysis areas not covered in the input from the Greater Yellowstone Coalition/Sierra Club input. The prescription that was selected under the amenity benchmark for each of these remaining analysis areas was identified and given the same identifier as those from group input.

Iteration 7 - This was the last iteration for this alternative. Constraints for this iteration included:

> the constraints common to all alternatives which forced conformance to the provisions of the Wyoming Wilderness Act and non-declining flow of timber.
>
> prescriptions were restricted to those as identified above; i.e. prescriptions from the amenity benchmark, from input from the Greater Yellowstone Coalition and from iteration 6 of the preliminary non-commodity alternative.
>
> An objective function of maximization of PNV using both market and assigned values was used in this alternative.

This run proved to be feasible and its results are as presented in this document.

Other than constraints common to all alternatives, the only constraint in this iteration and for the final alternative was that prescriptions selected in the amenity benchmark, by the Greater Yellowstone Coalition, or in the sixth iteration of the interdisciplinary teams non-commodity alternative be selected. The effect of this constraint is displayed in tables representing this alternative in this appensix.

Formulation of this alternative illustrates some features of the analysis procedures developed on the Forest. Analysis areas used in the final model were large, geographically unique areas. A full range of prescriptions was developed and tested in earlier models to identify those prescriptions that appeared to solve the full range of management problems facing the Forest in a cost efficient way. These were the only prescriptions included in the final FORPLAN model. Because of this testing and screening, they represent the most cost efficient management strategies for each analysis area; with each prescription designed to resolve a different set of issues and concerns on that area. It is possible, then, for the management team and like in this case, interested publics to deal with production of desired mixes of outputs on a forestwide basis as in more conventional FORPLAN analysis . It is also possible to identify desired management strategies for particular analysis areas in order to produce desired effects. This is particularly helpful when dealing with issues such as protection of grizzly bear habitat, or trying to address recreation and wildlife concerns in a specific geographic area on an analysis area by analysis area basis. In this case, it was possible for interested publics to concentrate on those analysis areas that make up that portion of the Greater Yellowstone ecosystem that is on the Forest and by examining prescriptions written for each analysis area, put together a coordinated management strategy for all lands within that area. This was guided by prescriptions selected in a benchmark and those selected in a preliminary alternative; both formulated using FORPLAN, forestwide constraints, and an objective function of maximization of PNV. But it represents a carefully designed management strategy for the Forest, built by coordinating management strategies on an analysis area by analysis area basis. The interdisciplinary team, the Forest management team, and those groups involved found that this capability greatly facilitated design and analysis of an alternative that is implementable and resolves the set of issues and concerns for which the alternative was designed in a cost efficient manner.

Alternative D - Preferred Alternative

The intent of this alternative was based on results of benchmark analysis, economic impact analysis, and social impact assessment. Based on the combined results of these analyses, the Forest management team selected a philosophy for the preferred alternative. This was to attempt to produce commodity goods and services at existing levels while emphasizing production of noncommodity goods and services.

Construction of this alternative was based on lessons learned from benchmarks, the current direction alternative, commodity alternative, and particularly the noncommodity alternative. Early iterations used constraints found in all of these. It took six iterations to formulate and analyze this alternative. Briefly these were:

Iteration 1 - This iteration attempted to blend constraints from the noncommodity emphasis alternative and the commodity emphasis alternative. Because this iteration was begun before the Wyoming Wilderness Act was passed, it did not meet all of the provisions of that Act. Constraints used included:

nondeclning flow for timber with the minimum amounts of timber to be produced in the first decade set at the same levels by market area as the current direction alternative. (As stated earlier, these floors on production of timber did not appear to have an effect on timber production because timber produced first decade exceeded them.)

used a modified version of the optimum recreation constraints based on lessons learned in the preliminary noncommodity alternative.

constrained wilderness prescriptions to meet provision of the Wyoming Wilderness Act except for management of the Dunoir. For the Dunoir Special Management Area, set management of 11,100 acres as wilderness and 17,700 acres for nonmotorized, semiprimitive recreation with an emphasis on wildlife habitat improvement.

used the standard constraint for eliminating from consideration prescriptions that had a high risk of water quality degredation in order to capture the emphasis on noncommodity goods and services.

set a minimum for production of forage for cattle at 78,300 AUMs. This was higher than in the commodity emphasis alternative, but still within the maximum identified in benchmarks. This, like the floors on timber production, was included to meet production of commodity goods and services as discussed in the philosophy of this alternative.

set a limit on the amount of moderate hazard land available for surface occupancy for oil and gas operations. This constraint does not meet legal provisions, but was used as handle for meeting the emphasis of this alternative. Those lands would not be removed from the land base available for surface occupancy, but this was a way to identify where oil and gas operations would have to meet the intent of this alternative; i.e. produce commodities in a way that is has at least a neutral effect on non-commodity production if not a positive effect.

because of a modeling error, production of forage for domestic sheep in benchmarks appeared to far exceed projected demands, even with a limit on the amount valued in calculation of PNV. A constraint was added to limit production of forage for domestic sheep to 50000 animal months.

This run was infeasible. Reasons for the infeasibility appeared to be a conflict between the mix of recreation requested and production of commodities.

Iteration 2 - This iteration attempted to resolve apparent conflicts on prodcution of recreation and commodities by revising the mix of recreation opportunities that should be produced. All other constraints remained the same.

This iteration was infeasible. Reasons appeared to be that too many AUMs of cattle forage were being requested given the limit of moderate hazard acres allowed for surface occupancy. (When prescriptions were developed, as stated, they were written as mini-plans that included management of all resources within an analysis area in a compatible way. Often prescriptions that included high production of forage for domestic cattle also allowed for intensive timber management with least restrictions possible on such management as well as minimum restrictions necessary for protecting surface resources from an oil and gas development standpoint. In this iteration, it appeared that there was a lack of prescriptions that provided jointly for high levels of domestic livestock and high restrictions on oil and gas development.)

Iteration 3 - This iteration attempted to resolve infeasibilities as identified above. Minimum level for cattle AUMs was reduced from over 78,000 to 74,000 and acres for surface occupancy on moderate hazard land was increased from 225,000 acres to 250,000 acres. Also because of a problem on one analysis area, the amount of semi-primitive recreation requested for the Greybull District was reduced from 7300 RVDs to 6000 RVDs.

This iteration was infeasible. Infeasibilities appeared to relate to the amount of wilderness recreation requested. Also it was noted that prescriptions for grazing of domestic sheep were occuring on Districts where there is no demand, and little was occuring on Districts where there were sheep operations.

Iteration 4 - This iteration attempted to resolve infeasibilities identified in iteration 3. This was done by requiring a minimum amount of sheep grazing on the Lander and Greybull Districts where there was existing demands for such grazing and adjusting semi-primitive recreation constraints to match what could be produced given the provisions of the Wyoming Wilderness Act.

Iteration 4 met all constraints except that a prescription for a single analysis area on the Greybull District could not be found that would resolve remaining amounts of production objectives.

A management team meeting was called to examine the results of iteration 4. During this meeting, a final decision was made not to do a re-analysis of the Dunior Special Management Unit at this time for that appeared to violate the intent of the Wyoming Wilderness Act. It was also decided that placing a limit on the amount of moderate hazard land available for surface occupancy violated existing minerals laws and would be impossible to administer. To correct this, it was decided that all lands capable of withstanding surface occupancy for oil and gas operations would be available in all alternatives and that in areas where such operations would pose a high risk to soil and water minimums or would violate the intent of the management strategy chosen for an area, lease stipulations and recommendations that would guide formulation of development plans would be specified to reduce risks to soil and water and meet the intent of the chosen prescriptions. These stipulations and operating standards that would be recommended are included in the minerals appendix to the proposed plan.

Each prescription that had been selected for implementation under iteration 4 was carefully examined to see if it met the intent of this alternative in the judgement of the management team. All but 10 prescriptions so selected did meet this intent. For 8 of these analysis areas, all that was required was specification of standards that would be recommended for oil and gas development when and if such development was proposed by an operator. Application of these standards is discussed in Appendix K of the Proposed Plan. These changes did not effect proposed practices within each prescription nor costs, benefits or production levels estimated for each prescription. The other 2 prescriptions required minor adjustments in practices included and mix of outputs produced. On one area, this involved changing the "cut-to-wildlife" of forage from some of the lands suitable for livestock grazing from 100% to 80%. This did not change the PNV of the prescription enough to have changed the allocation based on examination of this prescription and others written for that analysis area. The remaining prescription required a shift in the number of acres managed for semi-primitive nonmotorized recreation versus semi-primitive motorized recreation. This shift effected 10% of the analysis area and changes in PNV again were not significant enough to change selection of this prescription given an examination of other prescriptions written for this analysis area.

Based on the first 4 iterations and the minor modifications made by the management team based on their professional judgements and field experience regarding the the relevancy of prescriptions to meet thy intent of this alternative, a set of prescriptions was identified. A constraint was written to allow only these prescriptions to be considered for this alternative. All other constraints were removed except nondeclining flow, and constraints to meet the provisions of the Wyoming Wilderness Act.

This iteration was feasible and its results and effects are the ones reported in this document.

Alternative E - Reduced Budget Alternative

The intent of this alternative was to investigate how the Forest would be managed if the budget were reduced to a level of 25 percent less than the Fiscal Year 1982 budget. (Though 1982 was used as the base as required, the budget for that year was lower than budgets for succeeding years and lower than previous budget trends would have indicated.)

Constraints on this alternative included nondeclining flow of timber and meeting the provisions of the Wyoming Wilderness Act common to all alternatives.

Because the 25 percent reduced budget benchmark eliminated the timber program on the Forest, and because that appeared to be nonimplementable, a minimum level of timber by market area was set. These were 1 million board feet per year for the north half of the Forest and 2 million board feet for the south half. Both are much lower than current harvests and represent the minimum necessary to have an active timber program given market conditions.

The objective funciton used for this alternative was maximization of PNV using market and assigned values.

This alternative was formulated in a single iteration and the effects are presented in this document.

Alterntive F- National Needs Alternative (RPA)

As part of the requirements of Forest Planning, an alternative designed to meet targets as assigned through the RPA porgram is needed. This alternative meets this requirement.

All common constraints were included.

Production targets as assigned to the Forest through the Regional Guide were used as minimum production constraints for timber, cattle forage, and domestic sheep forage. For timber, these constraints were 10 million board feet per year for the first decade and 11 million board feet per year for decade 2 to 5. Cattle AUMs were set at at least 81,600 and sheep animal months at 27,000 per year for the first decade. All other assigned targets were met given these constraints.

Maximization of PNV was the objective function for this alternative.

This alternative was formulated in a single iteration and its results are those represented in this document.

SUMMARY

Alternatives were created relying heavily on previous analysis. This included analysis of issues, concerns, and opportunities leading to development of Goals and eventually to development of management strategies for specific pieces of ground. These management strategies included specific practices such as fence construction and recreation use administration, a schedule for those practices based on attempts to capture efficiencies of their coordinated implementation, and standards and guidelines for implementation of those practices. Standards and guidelines were selected to achieve the particular set of Goals for a management strategy as well as all multiple-use coordination requirements of 36 CFR 219 and legal minimums for protection of soil and water and threatened and endangered species.

Early analysis included formulation of preliminary alternatives and benchmarks. This analysis was done using a steady state FORPLAN model. Because it was a steady state model, construction of prescriptions, estimation of resulting production of goods and services, and estimating costs was relatively simple. The resulting model itself was relatively simple and very inexpensive to run. Because of this a great deal of analysis could be done in a very cost effective way. This early analysis was done to identify a set of prescriptions that were necessary to resolve issues, concerns and opportunities in a cost efficient way. This resulting set of prescriptions was refined using the experience and knowledge of District personnel. This was done to capture the knowledge these people have of actual conditions on each analysis area and their judgements in deciding how operational efficiencies could be captured in terms of coordinated implementation of practices included in each prescription.

The resulting prescriptions were modeled in the final FORPLAN model used in analysis. Seventeen benchmarks were formulated and analyzed to identify the latitude available for addressing issues, concerns, and opportunities. While this was being done, preliminary alternatives analyzed using the first FORPLAN model were analyzed in terms of the social and economic impacts. Results from these analyses and results from the seventeen benchmarks provided a great deal of input to formulation of alternatives.

Actual formulation of alternatives began with a clear statement of the intent of the alternative. The interdisciplinary team then attempted to define the minimum set of constraints necessary to meet the intent of each alternative. For some alternatives, this proved to be an easy task, for others it required several iterations (complete documentation of all iterations can be found in Planning Records). Results of FORPLAN analysis in terms of the prescriptions selected for each analysis area were reviewed by the interdisciplinary team, District personnel, and the management team. Similarly a group representing the Greater Yellowstone Coalition and Sierra Club reviewed prescriptions from the amenity benchmark to provide input to the non-commodity emphasis alternative.

Final formulation of three of the six alternatives was done by specifying the desired prescription for each analysis area. These selections were based on a full array of analysis and represented careful development of coordinated management strategies for the entire forest using the best judgement of the management team given results. For alternative A, this was the only way to model and analyze the effects of current direction. For alternatives C and D, the set of prescriptions written for a single analysis area (the Greybull analysis area) proved to be inadequate. This required modification of the standards associated with potential oil and gas development included in one of the prescriptions for this area. All other prescriptions selected in previous iterations in formulation of these alternatives were included in the set that was available to FORPLAN for the final FORPLAN analysis of these alternatives.

After examination of the prescriptions selected by FORPLAN for the other three alternatives, it was decided that the prescriptions selected could all be implemented in a coordinated way and that in total, they met the intent of each alternative.

Constraints used in formulation of all alternatives represented desired production levels for various goods and services. No constraints were necessary to represent coordination requirements or legal minimums for management of surface resources. Such considerations were built into standards and guidelines internal to each prescription. Again the full set of standards and guidelines had been tested for cost effieicncy in early analysis.

SUMMARY OF CHANGES BETWEEN DRAFT AND FINAL EIS

During the ninety day comment period on the DEIS and Proposed Plan, over 180 letters commenting on these documents were received by the Forest. Many of these letters contained concerns and suggestions as to how analysis and alternatives could be changed to better respond to issues, concerns and opportunities. As a result of these letters, changes in analysis models were made and all alternatives were reformulated and reanalyzed.

In response to comments and concerns, construction and reconstruction of roads were examined. It was determined that much of the concern was based on unclear discussions within the documents regarding the amount of new road construction. These discussions have been clarified. However, during this examination, it also appeared that there was an inaccurate accounting of roads and road costs in the previous analysis models. These inaccuracies were rectified and resulting changes in the model were shared with a number of analysts both within and outside the Forest Service. Changing the analysis model in these ways altered the amount of roads indicated as necessary for each alternative as well as the budget needs for construction, reconstruction and maintenance. The net effect is a decrease in new road construction within each alternative.

A companion issue to the road issue was the amount of area that would be accessed for timber harvest. Timber harvest levels, schedule for timber harvest, and analysis of areas suited for timber management were re-examined for all alternatives. In general, harvest levels in the first ten years remained about the same for each alternative as they were in the DEIS. The major changes in harvest levels occured in later decades and were generally lower for each alternative in these later decades than as shown in the DEIS. Even though timber harvest levels in the first ten years remained fairly consistent with the harvests reported in the DEIS, the amount of land managed for timber decreased in all alternatives. For the preferred alternative, for example, there was about a 15 percent decrease in the number of acres that are classified as suited for timber management.

As an outcome of this re-analysis and in response to public comments, some areas that had been planned for timber harvest and road construction in alternatives in the DEIS are now not scheduled for such harvest or road construction. This means that road construction is now not planned for some areas that are currently roadless. This decision is based on current conditions of supply and demand and will be re-analyzed when the Plan is revised some time in the next ten to fifteen years.

A number of comments addressed the use of fire as a management tool. In response to these comments, the potential role of fire both accidentally caused and deliberately caused, was examined. This resulted in more "liberal" fire precriptions is all alternatives, allowing fire to play more of its natural role in maintaining the health of ecosystems on the Forest. As a result of this re-analysis, though, it was determined that some of the multiple-use benefits associated with the timber program could not be accomplished through use of fire. In areas where the management intent is to open small patches within solid blocks of timber to improve wildlife habitat and vegetative diversity, control of fire to accomplish this task would be more expensive than accomplishing the same mosaic through timber harvest.

A number of comments were concerned about the economics of timber harvest calling for no below-cost timber sales. For this reason, the entire area of timber economics was re-examined. (This included a re-analysis of timber roads and their related economic considerations.) This re-examination was a partial reason the long-term sustained yield of all alternatives decreased and the amount of land in the suited timber base decreased for alternatives. If prices for timber remain at current levels (these levels are about the same as timber prices in the period of 1972 to 1982), then the timber management program in all alternatives more than pays for itself when considering costs directly attributable to timber and the stumpage prices received. No multiple-use benefits were included in this calculation even though they will be produced.

As a result of reformulation and analysis of all alternatives and in response to public comments, many outputs and effects of alternatives changed. However, beyond those mentioned above, such changes were minor. Such changes are discussed in Chapter VI on a comment by comment basis.

ANALYSIS OF TRADE-OFFS BETWEEN ALTERNATIVES

Often the constraints that were used for formulation of alternatives overlapped greatly in their effect. In other words, a constraint for production of a specific amount of forage for domestic livestock would cause a prescription to be chosen that also contributed to satisfaction of constraints on developed recreation, motorized recreation, water quality, and timber. Trying to separate out the effects of a particular constraint in such a case is impossible because it would depend on the order in which constraints would be applied. For example, applying the cattle AUM constraint first may show a large change in PNV; and then adding the recreation constraints yields no chnage in PNV. On the other hand, placing the recreation constraint on first would yield the result of a large PNV change for the recreation constraint and perhaps no change attributable to the cattle constraint. The question then is which constraint caused the change in PNV; and the only real answer is both.

As discussed earlier, analysis focused on design of cost efficient multiple-usemanagement strategies for specific areas on the Forest. As many as 58 such strategies were designed and tested for each analysis area. Because these strategies were coordinated, multiple-use management strategies, each one of them produced a specific mix of goods and services. The selection of any one of these prescriptions in an alternative is based on the combined production levels and the combined economic efficiency measures. In short, prescriptions are bundles of practices, standards, costs, production levels, and benefits. Breaking the bundles apart by practice, effect, or output destroys the continuity of the bundle and renders all estimates of costs, production levels and benefits invalid. Thus they are analyzed as discrete bundles. The effect of this, frequently, is the inability to say that a constraint on one output was the reason a specific prescription was chosen as opposed to the economic effects of a particular bundle or a constraint on another output. The analysis procedure used provided a mechanism for being very site specific; increase accuracy of estimates of costs, production levels and benefits; analyze site specific standards to meet coordination requirements and legal minimums; assure cost efficiency; and assure feasibility and implementability of the resulting plan. But it did not provide for a clean analytical approach for output by output or constraint by constraint analysis of trade-offs.

Production of amounts of some goods and services varied little between alternatives. This reflects the nature of the Forest. Less than 5 percent of the Forest is tentatively suitable timberland, only 12 percent of the Forest is suitable for grazing domestic livestock and about 50 percent of the Forest is wilderness. There is abundant summer range for wildlife as well as many acres of unsuitable timberland or timberland in wilderness to provide for species that use forest cover for habitat. There is very little opportunity for increasing water production and given the large proportion of the forest that is wilderness or where roads would be impractical the opportunities for effecting the mix of recreation provided is limited.

This means that conventional trade-off analysis between output levels of various goods and services tells little about the differences between alternatives. The differences between alternatives lie in the prescriptions selected for each analysis area and the forest conditions they are designed to achieve. Major differences in production of commodity outputs are not the differences in how much is produced but how that production is to be done; in other words, what forest conditions (Goals) the precription is designed to achieve. For example, one prescription for timbered areas allows even age silviculture to be applied in patches of up to forty acres in size. The forest condition for this prescription allows for meeting at least a modification visual quality objective, so the standards for how the cut blocks are laid out, screened, and feathered are set at a minimum.

Another prescription for timbered areas is designed to produce a forest condition that would have the maximum benefit for wildlife and high quality recreation. This condition sets a desired size for cut blocks at thirty acres, the shape of those blocks as oval, and spacing of blocks at least 600 feet apart. This condition provides an area that would be used by deer and elk by providing forage within 500 to 600 feet of cover; a condition found through research to be of maximum benefit for deer and elk. Adding in standards for feathering edges and meeting at least a partial retention visual quality class, and this condition provides visual diversity for high quality recreation.

The volumes produced by either of these prescriptions is the same. The difference is in the forest conditions sought in order to produce the effects desired. Also there would be increases in costs for project planning and sale administration. These are the real differences between alternatives and are discussed briefly here. Detailed presentations of the FORPLAN prescriptions chosen for the proposed plan are in Appendix J of the document. Detailed presentations of all other prescriptions including those selected in other alternatives are in Planning Records. Following is a discussion of alternatives and their relative effects. Included is a ranking of alternatives by PNV and a discussion of major reasons for change. Also alternatives are ranked in terms of cash flow and economic impacts.

ALTERNATIVE DESCRIPTIONS

The following alternative descriptions include a statement of the philosophy which guided the formulation of the alternative and highlights the salient features of the alternative. An alternative is composed of a specific FORPLAN prescription for each analysis area on the Forest. The FORPLAN prescriptions chosen depend on the overall emphasis of the alternative. Descriptions of each FORPLAN prescription chosen for implementation on each analysis area in each alternative are readily available in the planning records. The description of alternatives presented here is a Forest-wide perspective. Appendix J of the Forest Plan contains descriptions of the FORPLAN prescriptions designated for implementation on individual analysis areas in the preferred alternative. The planning records contain the same detail as shown in Appendix J for all alternatives.

In descriptions of the expected future condition, the standard of comparison is the current conditions on the Forest and what the conditions would be if current management direction were to remain unchanged.

Alternative A (Current Direction - No Action)

This alternative is designed to depict the effects of managing the Forest under goals and objectives of existing plans and policies. This provides a basis for comparing all other alternatives. It is also the no-action alternative as required by NEPA for it depicts what would happen of no action were taken to change the current management direction on the Forest. This alternative was formulated by creating FORPLAN prescriptions for each analysis area that portray implementation of current plans and policies and requiring FORPLAN to select these during analysis.

Distribution of recreation opportunities and types of recreation opportunites available will remain the same as is currently available. No new developed or dispersed recreation facilities will be constructed. Range management will be guided by existing allotment plans and all range currently available to domestic livestock will remain available. Timber harvest will be done as it has been over the last 5 to 10 years with standards allowing for the legal maximum in terms of cut block size and distribution. The suited land base drops about 3 percent from the 1976 Timber Management Plan; however, the allowable sale quantity increases by about 10 percent above that indicated in the 1976 Timber Management Plan. Road construction and reconstruction stay about the same as over the last 10 years with the same proportion of roads closed, open and controled through seasonal closures. Wildlife habitat improvements will continue and will utilize treatments specifically designed for wildlife as well as contination of timber harvests, range management and seasonal road closures to protect and enhance habitat. Oil and gas leasing and operations will be allowed under stipulations and operating standards that are selected to insure that minimum legal standards for surface resources are met.

Currently there are controversies surrounding oil and gas leasing and development; timber harvests; road construction; and wildlfie management. By continuing management direction and policies which caused these controversies, there is little that this alternative can do to resolve the issues involved. It does continue with current production levels and mixes of goods and services and therefore provides stability for those whose livelihoods and lifestyles are based on historic patterns of management on the Forest. In this way, it responds to issues and concerns regarding maintenance of the status quo including continued support of local recreation, ranching, and timber-based sectors of the economy. Further, by continuing such coordination efforts as helping develop and implementing the policies of such groups as the Greater Yellowstone Coordination Committee and the Interagency Grizzly Bear Committee as well as coordination efforts with the Wyoming Game and Fish Department, this alternative contributes to the maintenance of those portions of ecosystems that are part of the greater Yellowstone area which are under the Forest's control.

Expected Future Condition

Over time, about 3.5 percent of the Forest will be managed for timber. This minor portion of the Forest will be composed of a mosaic of even and all-age stands. The even-age stands will be of varying age classes and timber sizes and will be found in 40 acre blocks. Boundaries of some of these stands, particularly the younger age classes, will be easy to identify on the ground because standards for feathering and blending them with surrounding areas will be set at the minimum. Other timbered areas (about 40 percent of the Forest) will be characterized by old growth stands with dead standing timber and some timber laying on the ground. Throughout this portion of the Forest, there may be large areas (500 to 1000 acres in size) where there is evidance of a wildfire and an even-age timber stand growing back. Most areas where there are currently stands of aspen will still have an aspen cover type of various age classes for they will be treated through time to counter encroachment by conifers.

Domestic livestock will be found on about 11 percent of the Forest. Ecological condition of these and other range lands will be at or near climax vegetation communities. This will be true except for about 1 percent of the Forest where sagebrush-grassland ecosystems will be managed for a mosaic of sagebrush age classes.

There will be an increase in the amount of roads on the Forest of about 250 to 275 miles, with about 70 percent of these open to the public year round.

Existing recreation facilities including trails will exist and all will be in a high level of repair. About 55 percent of the areas classified as wilderness will have a well-developed trail system, while 15 percent will have no trails at all.

As in all alternatives, about 38 percent of the Forest will be available for oil and gas leasing. There will be some evidences of exploration activities. If a pool of oil and gas is discovered, development will be visually evident due to the minimum standards placed on such operations within this alternative.

Wildlife population targets established in 1985 including a recovered population of grizzly bears will be met. The only exception to this will be within the North Fork of the Shoshone herd units for bighorn sheep and elk. In these herd units, 40 percent of the Wyoming Game and Fish Department targets for bighorn sheep and 57 percent of their targets for elk will be met. Timber operations along with planned treatment of sage brush, aspen and willow will provide a healthy forest condition in early successional stages on about 13 percent of the Forest.

Impacts on local economies will be about the same as they are now and all commercial operations currently dependent on the forest will be supported.

Alternative B (Commodity Emphasis)

This alternative was formulated to address a set of issues and concerns requesting a high level of production of commodity-oriented goods and services. This includes a high level of timber production, a high level of production of forage for domestic livestock, and high levels of developed recreation opportunities including lodges and outfitters and guides. Also as part of this, stipulations and probable operating standards for oil and gas were kept at levels to meet legal minimums and thereby provide for the least restrictive environment for such operations.

Issues and concerns for which this alternative was designed include providing a maximum upward impact on declining local economies, increasing revenues to the U.S. Treasury, increasing revenues to local economies, and facilitating to the extent possible, exploration and development of domestic reserves of oil and gas.

This alternative was created by setting minimum production requirements for timber and forage for domestic livestock. Also a minimum production level for developed recreation that would meet or exceed developed recreation demand on all Ranger Districts was included. Finally, stipulations and probable operating standards for oil and gas leasing and operations were set to provide for only legal minimum standards on soil, water, air, and threatened and endangered species.

Developed recreation is higher in this alternative when compared with all other alternatives as are expenditures for developed recreation facility construction. Dispersed nonwilderness recreation is also higher than that of Alternative A though expenditures for facilities such as trailheads decline. This means that there is a slight shift from nonmotorized recreation toward motorized and developed recreation opportunities. Wilderness recreation management emphasizes primitive recreation opportunities over both pristine and semiprimitive when compared with Alternative A. Management of range ecosystems is intensified with increases in forage available for domestic livestock. Also this increase in intensity of management of range ecosystems increased both forage available for wildlife and wildlife habitat improvement. Acreage of timberland suited for timber management increased by almost 20 percent when compared with Alternative A. This resulted in the highest planned timber harvest of all alternatives with an allowable sale quantity of 12.88 MMBF for the first decade. Construction of new roads and reconstruction of existing roads is less in this alternative than in Alternative A with more miles of road closed to public access and seasonally closed. This means that public access to the Forest will decline somewhat when compared with continuation of existing plans and policies.

This alternative has many advantages over Alternative A. It increases income to Federal, State and local governments. It increases the amount of commodities produced and thereby provides the maximum upward impact on local economies that are currently depressed. It increases the amount of developed recreation provided, thus increasing the ability of the Forest to provide facilities to those visiting neighboring National Parks during times when they are filled to capacity. Increased intensity of range management and timber management will provide for a better mix of successional stages for wildlife and improve wildlife habitat. The closing of more roads or controlling those roads will provide less disturbance to those wildlife populations. From an energy independence standpoint, this alternative (as well as Alternatives E and F) provide for the least restrictions on oil and gas operations, thereby facilitating such operations to the maximum legal extent.

Disadvantages of this alternative when compared with Alternative A include less access to the Forest. With only 15 percent of the Forest currently accessible by roads, decreases in access can have a significant effect to the Forest user. Current oil and gas policies are causing polarization of local communities as are current timber harvest levels. This alternative would exacerbate such controversies and could have a negative effect locally, regionally and nationally.

Expected Future Condition

About 4.3 percent of the Forest will be managed for timber. The forest condition on this portion of the Forest will be the same as the managed portion of Alternative A. This increase in timber area being managed will provide a modest increase in habitat for wildlife species dependent on early successional stages of timber such as deer and elk. Further this reduces to about 39 percent of the Forest that will be in timber covered and in old growth conditions (only about 45 percent of the Forest is classified as being able to support stands of trees). Visual quality of both types of areas will be similar to those in Alternative A.

Domestic livestock will be found on slightly less acreage (10.5 percent of the Forest) than in Alternative A. This and all other range will be in good ecological condition. There will be more range structures in the form of fences and small water developments dotted across areas being grazed by cattle because of the increased intensity of range management within this alternative. Further, more areas of sage and aspen will be treated, adding to ecological diversity when compared with Alternative A. This should support slightly increased wildlife populations and/or the same populations in higher quality habitat. All population targets set by the Wyoming Game and Fish in 1985 will be met except only 60 percent of the target for the North Fork elk herd unit. The grizzly population will be at or above recovered levels.

Road increases will be less than in Alternative A with more roads either closed to public access or controlled seasonally.

There will be more developed recreation facilities but fewer facilities supporting nonmotorized recreation than in Alternative A. There will be about a 5 percent decrease areas which have no trails in areas designated as wilderness. Areas with few trails will increase by about 5 percent and areas within wilderness with well developed trail systems will decrease by about 6 percent.

Restrictions on oil and gas are slightly lower in some areas on the Forest than in Alternative A. Therefore, there may be some minor increases in visually evident oil and gas operations, particularly if a pool of oil and/or natural gas is discovered on the Forest. Also, there would be a slight increase in disturbance to wildlife from such operations should they occur.
A combination of timber harvest and treatment of sage, aspen, and willow will provide a healthy forest condition in early successional stages on about 15 percent of the Forest.

Economic impacts on local economies will be the highest of all alternatives in terms of supporting those economies and tax revenues generated.

Alternative C (Noncommodity Emphasis)

This alternative was formulated to address a set of issues and concerns calling for a limitation on commodity production on the Forest. Such comments requested less timber harvest (from none to about 8 MMBF per year), less grazing of domestic livestock, and a curtailment of oil and gas leasing and operations on the Forest.

Issues and concerns for which this alternative was designed include protection of the greater Yellowstone ecosystems, protection of visual quality, protection of high quality recreation experiences, protection of water quality, and protection of wildlife including threatened and endangered species.

This alternative was formulated based on input provided by representatives of the Sierra Club and Greater Yellowstone Coalition. Management strategies selected in the amenity benchmark were modified and formed the basis of those strategies chosen for this alternative. There was a tendancy for timber to be produced at a level which maximized economic efficiency. This level was higher than that called for by this alternative, so an upper limit on timber production for the first 10 years was needed to meet the intent of this alternative.

When compared with Alternative A, this alternative:

- changes the mix of nonwilderness recreation toward more nonmotorized recreation and less developed and roaded recreation. This effects the ability of the Forest to provide for overflow camping in times when neighboring National Parks are filled to capacity, but addresses issues and concerns calling for more nonmotoized recreation opprotunities away from the sights and sounds of man.

- has a significant increase in forage available for wildlife.

- decreases both timber and grazing of domestic livestock significantly. This again addresses issues and concerns calling for nonmotorized recreation away from the sights and sounds of man, but will have a significant effect on some ranchers and sawmill owners who are dependent on the Forest for their livelihood.

- places stringent stipulations and probable operating standards on oil and gas leasing and operations to the point that any such operations would have minimum effects on visuals, recreation and wildlife as well as meeting legal minimums for soil, water, air and wildife.

- provides less motorized access to the Forest.

Expected Future Condition

About 2.9 percent of the Forest will be managed for timber. The forest condition on this portion of the Forest will be a mosaic of all age and even-age stands. The even-age stands will be of varying age classes. The edge of each stand will be more difficult to discern than in Alternatives A and B because of standards to blend and feather such edges with surrounding stands. Stand size will generally be slightly smaller (5 to 10 acres smaller) than stands in Alternative A. As in all alternatives, roads built into timberlands for logging purposes will be closed to public use. The remaining 41 percent of the Forest with timber cover will be dominated by old growth stands with some dead and dying trees evident. There will also be evidences of fires of the 500 acre to 2000 acre size spotted throughout this area.

Domestic livestock will be found on only about 6 percent of the Forest. The ecological condition of these and other rangelands will be good to excellent in terms of climax vegetation. About 50 percent of the sagebrush grassland areas treated in Alternative A will be treated in this alternative. Therefore, in this ecosystem, there will be more areas dominated by sagebrush of higher density and size. This will benefit wildlife requiring such sagebrush, but will be detrimental to other wildlife.

Road densities will be slightly lower than in Alternative A with over twice as many roads closed and a 25 percent increase in seasonal road closures. The net effect will be a reduction in motorized access and an increase in areas away from roads.

There will be fewer campgrounds and trailheads provided with some exisiting areas being closed and obliterated. There will be a large increase in areas outside of wilderness managed for nonmotorized recreation with horse and foot trails replacing four-wheel drive trails. Wilderness areas where there are no developed trails will decrease while areas where there is a highly developed trail system will increase.

Because of the restrictions placed on oil and gas activities, they will not be visually evident, in general. When they are, they will be blended into the terrain and away from areas receiving concentrated recreation use.

Decreases in timber management and treatment of sagebrush, aspen and willow will decrease the amount of area in a healthy forest condition in early successional stages by about 50 percent when compared with Alternative A. This will have some impact on such wildlife as deer, elk and moose that require early successional stages mixed with later successional stages. Wildlife summer range will increase dramatically, spring-fall range will suffer some loss, and there will be a slight increase in winter range when compared with that produced in Alternative A. Conifers will continue closing in on spring and fall ranges and aspen stands. Wildlife population targets established in 1985 for all species including threatened and endangered species will be met; except only 74 percent of the North Fork elk herd unit targets could be met.

Economic impacts of this alternative would be the least of all alternatives except Alternative E.

Alternative D (Preferred)

This alternative was designed to maximize net public benefits by balancing production of commodities and amenities in response to issues and concerns. The philosophy of this alternative is to emphasize amenity values while producting commodities at historic levels. This philosophy was developed based on a comprehensive examination of benchmarks and their results, preliminary alternatives, and some of the other final alternatives. As such it combines features of Alternatives B and C, the maximum PNV benchmark, the amenity benchmark, and the District Rangers' alternative which was eliminated from detailed study.

Issues and concerns for which this alternative was designed included maintaining viability of ecosystems on the Forest in recognition of their role in the greater Yellowstone area; providing high quality, low density recreation; meeting production needs of existing dependent commercial operations including timber, ranching, outfitting and guiding and recreation based sectors; increasing public access to the Forest; protecting and enhancing soil, air and water resources; improving wildlife habitat; and providing for oil and gas leasing and operations in a way that will blend these operations with the physical and biological features of this Forest.

This alternative was created by setting minimum production levels for each type of recreation opportunity by Ranger District. These production levels favored high quality, low density types of recreation. Also standards and guidelines for timber harvest, grazing of domestic livestock and oil and gas leasing were included to blend these operations into the management philosophy of this alternative.

Production of timber in this alternative is slightly below that of Alternative A but about the same or slightly higher than in the 1976 Timber Management Plan. Production of forage for domestic livestock is about the same as Alternative A with a shift toward more cattle and fewer sheep. Developed recreation was increased to a level between Alternatives A and B. While dispersed recreation, both motorized and nonmotorized, is produced at levels between Alternatives B and C with about the same support for dispersed recreation facilities as Alternative C. Treatment of vegetation to improve wildlife habitat is the highest in this alternative when compared to all others and forage available for wildlife is about the same as Alternative A. Oil and gas leasing is allowed on the same number of acres as in all alternatives, but the stipulations and probable operating standards for leasing and subsequent operations are more stringent than any other alternative except C.

Advantages/disadvantages of this alternative when compared with Alternative A include:

- enough production of timber and forage for domestic livestock to support historic levels of these economic sectors;
- a shift in recreation produced to emphasize high quality, low density recreation inside and outside of wilderness;
- a shift in standards for timber, grazing and oil and gas leasing to blend these activities into a philosophy of maintaining or enhancing wildlife habitat, visual quality, and recreation opportunites;
- increasing developed recreation to help provide for capacity that may be needed when neighboring National Parks are filled to capacity;
- increased access to the Forest with appropriate seasonal restrictions on that access to protect soil, water and wildlife resource values; and
- because of increased standards on commodity production, costs for those engaged in such operations will be higher.

Expected Future Condition

About 3.5 percent of the Forest will be managed for timber. The forest condition on this portion of the Forest will be similar to that under Alternative C. That is there will be a mosaic of even-age and all-age stands; even-age stands will be about 30 acres in size with their edges blended and feathered with adjoining stands to maintain visual quality. The forest condition on the remaining timbered area on the Forest, about 40 percent of the Forest, will be dominated by old growth stands with some dead and dying trees. Within this area, there may be evidence of past fires ranging in size from 500 acres to 2000 acres. Visual quality of both types of areas will be similar to Alternative C.

Domestic livestock will be found on about 10.5 percent of the forest. This and other rangeland on the Forest will be in good ecological condition. There will not be a marked increase in fences or water developments over that which would be found in Alternative A. More sagebrush-grassland areas will be managed for a mixture of sagebrush structural stages than in any othr alternative. This will improve habitat for wildlife requiring early structural stages as well as provide an adaquate amount of later structural stages for those species requiring these. This treatment plus timber management, treatment of aspen and willow, will provide for improved wildlife habitat over that which would result from Alternative A.

Road construction and reconstruction are lower in this alternative than in either Alternatives A or C. Also roads closed year round to public access is the lowest in this alternative than any other. However, seasonal road closures are about double what they would be under Alternative A. This combination of raod management strategies will provide better access to the Forest while protecting soil, water and wildlife during sensitive periods.

There will be more developed recreation sites on the Forest. These will be scattered to keep density low and disperse use over a wider area. Both motorized and nonmotorized nonwilderness recreation will be found than in Alternative A. This again is the result of trying to disperse use and keep user density down. Within wilderness, there will be a significant increase in areas managed for primitive and pristine wildderness with a slight decline in semiprimitive areas. This means that wilderness areas will have, in general, fewer trails and that managed density of recreation users will be lower as use is dispersed away from currently heavily used areas.

Wyoming Game and Fish Department herd unit targets established in 1985 will be met for all herd units except that only 63 percent of the North Fork elk herd unit target will be met. Grizzly bears will have recovered and habitat will be provided for other threatened and endangered species.

Economic impacts on local areas will be the second highest of all alternatives.

Alternative E (Reduced Budget)

Given the budget problems of the Federal government over the last several years, this alternative was created to address the concern about what would happen if the budget of the Forest were reduced by 25 percent from its fiscal year 1982 level. This was the main issue and concern this alternative was designed to address.

Formulation of this alternative was done by placing an upper limit on the budget for the first decade to reflect the 25 percent reduction from the fiscal year 1982 level. Also, based on examination of the 25 percent reduced budget benchmark, a minimum level of timber production was required in order to make this alternative realistic.

Expenditures for developed recreation and developed recreation use is the lowest in this alternative than in any other alternative. The same is true for all types of nonwilderness and wilderness recreation. Timber harvest drops by 72 percent and forage provided for domestic livestock drops by 56 percent when compared with Alternative A. Management of sagebrush, aspen and willow for wildlife purposes also drop dramatically. Road construction, reconstruction and maintenance are reduced and trail maintenance is done on less than 50 percent of the existing trail network. With the dramatic decrease in forage available for domestic livestock, there was an increase in forage available for wildlife.

All areas that are available for leasing in every alternative are available in this alternative. Stipulations for leasing and probable operating standards for leasing and subsequent operations are the same as in Alternative B.

Expected Future Condition

Timber is managed on about 1 percent of the Forest. The forest condition on this portion of the Forest will be about the same as the managed portion of Alternative B. The remaining timberland will be in an old growth condition with dead and dying trees. There will be evidences of fires of the 500 acre to 2000 acre size scattered through this remaining timberland.

Domestic livestock will be found on about 3.2 percent of the Forest. This and other range will be in good ecological conditions. Because of a dramatic decrease in treatment of sagebrush, sagebrush-grasslands will be dominated by dense stands of sagebrush.

Road density will be less than in Alternative A with proportional decreases in the amount of roads open, closed and seasonally restricted. This will decrease dramatically access to the Forest by motorized vehicles.

There will be slightly fewer developed recreation facilities and the quality in terms of maintenance and age of structures will be significantly less than in Alternative A. Support of dispersed facilities and trails is also significantly less (over 50 percent less) than in Alternative A. This will mean, in the long term, trails and facilities will be in a poor state of repair and difficult to traverse. This will significantly lower visual quality and the quality of recreation experiences provided.

Habitat for old growth, climax vegetation dependent species will predominate. Reductions in aspen treatment and elimination of willow management will mean that these areas will be virutally eliminated in terms of their support of wildlife except in areas where wildfire has occurred. Conifers will encroach on exisiting aspen stands, small meadows, and migration routes for wildlife which will degrade wildlife habitat over time. Over the next 10 years, population targets for wildlife established in 1985 by the Wyoming Game and Fish Department will be met except for the North Fork elk herd unit. Here, only 92 percent of this target will be met. The grizzly bear will achieve a recovered population level by the end of the 50 year planning horizon.

Restrictions on oil and gas leasing and operations are similar to Alternative B. If they occur, they will be visually evident and may impact wildlife and recreation.

Because of reductions in timber, grazing of domestic livestock, recreation and perhaps wildlife, this alternative will have a downward impact on all sectors of the local economy. The one exception is the oil and gas industry which will be operating under minimum standards.

Alternative F (RPA)

This alternative is designed to identify the costs and effects of meeting the Forest's share of National production of goods and services as disaggregated in the RPA program. This alternative, therefore, focusses on issues and concerns related to regional and national issues of meeting the needs of the American public in terms of goods and services produced. This alternative was required because none of the other alternatives met the target for forage for domestic livestock given in RPA targets. (A number of alternatives met or exceeded RPA targets for timber and recreation.)

The major difference between this alternative and Alternative A is that forage for domestic livestock is increased by 5.5 percent. This is accomplished on slightly fewer acres through more intensive range management practices. Other differences include a 20 percent increase in acres treated to improve wildlife habitat and a 6 percent decrease in timber production.

There are no significant differences in the set of issues and concerns addressed by this alternative over those addressed by Alternative A.

Expected Future Condition

When compared with Alternative A, there are only minor differences in the condition of the Forest that will be achieved over the long run by this alternative. Road density will be slightly less and there will be an increase in the number of miles of road that will experience seasonal closures. Timber will be managed on about the same number of acres and the conditions of those acres as well as unmanaged timber will be the same as in Alternative A.

Treatment of range vegetation for cattle and wildlife will increase. This will mean that in some areas on the Forest, there will be a significant improvement in habitat for wildlife which are dependent on a mix of age classes for aspen and sagebrush. This effect will not be of much significance forest-wide, but will aid spring and fall range for wildlife and lessen competion between wildlife and cattle. All range, including that grazed by domestic livestock, will be in good ecological condition.

There will be no perceptible difference in recreation facilities or trails between this alternative and Alternative A. There will be slight increases in recreation use in all catagories in nonwilderness areas. In wilderness areas, both the amount of area managed with well-developed trails and areas where there are no trails, increase in size. This shifts the mix of wilderness use from primitive opportunities to increases in both pristine and semiprimitive opportunities.

Wildlife habitat will have a minor increase in quality and population targets set by the State of Wyoming in 1985 will be met for all herd units except the North Fork elk herd unit. Here, 57 percent of the target will be met. Grizzly bear habitat will be managed per the interagency grizzly bear guidelines as in all alternatives, so that long term, there will be a recovered population of bears.

Oil and gas leasing and exploration will be done under stipulations and probable operating standards as in Alternative B. Thus there could be some increases in visual degredation over that which would occur under Alternative A.

Because of increases in forage for domestic livestock and recreation with no significant loss in timber production, this alternative will have a moderate impact on local economies and will impact them to a greater extent than Alternative A.

Economic Efficiency Effects

Present net value (PNV) is the measure of economic efficiency used in forest planning. It is defined as the difference between the discounted dollar value of all priced outputs and the discounted value of all expenditures for management and investment. The process of discounting expresses all values at a common date. A large PNV indicates that the public, as owners of the National Forest, could realize a large net return from their investment. A smaller PNV indicates a smaller net return could be realized.

The purpose of Forest Planning is to select an alternative that will maximize the benefit to the American public through management of the Forest. PNV is an important component or effect that is included in net public benefits. Because it includes the costs to taxpayers of producing all benefits, the real returns to the treasury associated with producing market-valued outputs, and the estimated worth of nonmarket-valued outputs, it provides a means of examining differences between alternatives.

Prices have not been assigned to all benefits, nor have methodologies for including all benefits in modeling been developed. It is primarily the desire or need of producing such nonpriced benefits that would cause selection of a alternative with a lower PNV than the maximum. Such nonpriced benefits include certain outputs, such as threatened and endangered species; certain physical conditions such as areas with high quality scenery; certain distributional effects, such as where the high quality scenery or wildlife winter range is located; certain reductions in risk, such as species and age distribution control for insect and disease management; and social and economic impact considerations.

Beyond these goods and services not valued in analysis, there is often an inability to distinguish various quality levels directly in economic efficiency analysis. This is particularly important when evaluating such things as the wildlife habitat or recreation opportunities provided by an alternative. In such instances, production levels between alternatives may vary little; however, because of standards and guidelines used in that production, quality of outputs can vary greatly.

The future value to society of the Forest will depend upon the mix of economic and other values that are produced, the quality of those values, the costs of managing the Forest to produce those values, and the way society is affected. Trade-offs between goods and services (recreation versus timber production for example) is not a simple comparison between production levels of two or more outputs. This is because production of an individual good or service is not independent of production of other goods or services. For example, depending on the standards used to lay out timber sales, they can have either a beneficial or negative effect on wildlife. Large cut blocks are less expensive to prepare and to cut, but provide low quality edge for wildlife. Cut blocks of 25 to 35 acres with edges that provide security cover for wildlife can have a very beneficial efffect on the same species of wildlife while costing more from both a preparation and harvest standpoint. Following this logic, trade-offs are really between the forest conditions created by management and the mix of goods and services produced by those forest conditions, not between production levels of one output versus levels of another.

Formulation and analysis of alternatives on the Forest focussed on alternative forest conditions by major ecosystem type (forested ecosystem, sagebrush grassland ecosystem, and/or aquatic ecosystems). The forest conditions modeled and used to build alternatives were designed to resolve sets of issues, concerns, and opportunites identified throughout the planning effort. This means that a simple discussion of trade-offs of output levels or of economic indicators provides an incomplete picture of the real differences between alternatives. Even though this is true, such discussions are presented as part of the overall discussion of differences between alternatives.

As an example, examine the differences between Alternatives C and D, particularly in the area of timber harvest. A common belief is that timber harvest is detrimental to wildlife and therefore an alternative that harvests less timber is better from a wildlife standpoint. Effects on wildlife, though, are not as much of a function of how much is harvested but rather how and where such harvest is to take place. Further, as a side issue, wildlife are very much effected by the amount of roads left open for public use in such harvest areas. Comparisons between these alternatives from a timber versus wildlife standpoint, therefore would require an examination of the standards for harvesting, the types of forest conditions that would be achieved through such harvest, existing cover to forage ratios in areas where harvest is planned, and how roads used to support timber harvest will be managed in terms of public use. In the case of current conditions on the Forest, commercial timber cover often exists in large blocks between summer and winter ranges for such species as deer and elk. Further, the current age distribution is skewed toward mature to over-mature timber providing poor cover-to-forage ratios and low quality edge. Given that standards for harvest require cut blocks no larger than 40 acres surrounded by cover and that all roads built exclusively for timber harvest are to be closed to public access; in general, the more timber harvested, the greater benefits to wildlife in terms of high quality edge and habitat. In short, simple one on one trade-off comparisons between alternatives would tend to favor Alternative C while more detailed examination shows that Alternative D provides better edge and structural diversity for wildlife. Thus simple trade-off comparisons, though important and of interest, provide only partial information when comparing alternative management strategies for complex ecosystems.

Each alternative was developed to efficiently address a set of issues and concerns. This was done through design and analysis of alternative forest conditions that could be achieved throughout the Forest. As such, each alternative provides a different mix or pattern of outputs and a different set of environmental, economic, and social effects. This section discusses patterns of differences in economic effects.

Differences between alternatives in terms of PNV, benefits produced and costs incurred, are illustrated in Tables B-6 and B-7. Both tables display alternatives in order of decreasing PNV. Table B-6 provides detail on incremental changes between alternatives in total discounted costs and total discounted benefits. Table B-7 provides more detail in terms of the contribution to costs and benefits attibuted to various classifications of goods and services.

The benchmark which maximizes PNV is also displayed in these tables to provide a basis for comparing each alternative with costs, benefits, and PNV which would result from managing the Forest from a maximum cost efficiency standpoint. Because only production levels and not quality of outputs are measured in economic efficiency and because production levels of outputs are similar in all alternatives, ranking by PNV follows ranking by total discounted cost fairly closely. This is true except for Alternatives C and E which de-emphasize production of commodities. Costs for these alternatives are lower than all other alternatives. However, the losses to total discounted benefits because of much lower timber harvest levels and grazing of domestic livestock in these alternatives exceed decreases in costs. As stated earlier, this is due in part to the fact that benefits from timber and range programs generally exceed their costs on the Forest.

TABLE B-6

Comparison of Present Net Value, Discounted Costs, and Discounted Benefits* (Billions of Dollars)

Benchmark or Alternative	PNV	Incremental Change in PNV	Discounted Cost	Incremental Change in Discounted Costs	Discounted Benefits	Incremental Change inal Discounted Benefits	Benefit Cost Ratio
Max PNV	419.1	--	102.9	--	522.	--	5.07
F RPA	418.92	-0.18	103.98	+1.08	522.9	+0.9	5.03
B Commodity Emphasis	416.6	-2.32	109.1	+5.12	525.7	+2.8	4.82
D Preferred	409.3	-7.3	107.6	-1.5	516.9	-8.8	4.80
A Current Direction	407.1	-2.2	110.9	+3.3	518.	+1.1	4.67
C Noncommodity Emphasis	406.8	-0.3	103.2	-7.7	510.	-8.0	4.94
E Reduced Budget	394.	-12.8	48.5	-54.7	442.5	-67.5	9.12

* All values are presented as incremental above minimum level management benchmark values.

TABLE B-7

Comparison of Present Net Value, Discounted Benefits, and Discounted Costs by Resource Area (Billions of Dollars)[1]

Benchmark or Alternative	PNV	Recreation Benefits	Range Benefits	Timber Benefits	Water Benefits	Returns to Treasury	Recreation Costs		Roads & Facilities Costs		Timber Costs	Wildlife Costs	Range Costs
							Facilities & Trails Maintenance	Operation and Administration	Construction and Reconstruction	Operation and Maintenance			
Max PNV	419.1	469.8	22.78	12.61	3.94	18.77	23.81	6.03	8.61	13.07	6.08	1.92	1.03
F RPA	418.9	469.8	23.19	12.88	3.95	19.10	24.68	6.05	8.50	13.05	6.22	1.97	1.06
B Commodity Emphasis	416.6	469.8	22.60	15.19	5.00	21.31	25.16	5.55	10.35	13.03	9.18	2.05	1.04
D Preferred	409.3	468.9	21.96	13.25	4.06	19.27	25.15	5.48	10.13	13.90	6.44	1.97	1.13
A Current Direction	407.1	468.8	22.07	13.75	4.18	19.79	26.44	5.62	12.14	14.14	6.66	1.90	1.16
C Noncommodity Emphasis	406.8	469.8	16.34	10.54	3.51	15.70	25.58	5.64	8.55	12.92	4.97	2.05	0.84
E Reduced Budget	394.0	419.2	9.07	3.57	2.02	7.45	17.29	2.33	3.09	8.28	1.98	1.11	0.40

1/ All values are presented as incremental above minimum level benchmark values. Costs and benefits by resource area do not account for total costs and benefits. Some resource costs and benefits such as those associated with soil, water, and air are not shown, nor are fixed costs of running the Forest. Costs by resource area represent variable cost above fixed costs. Fixed costs varied insignificantly by alternative. Caution must be used in comparing resource area costs and benefits because costs attributed to one area provide benefits to other areas; for example costs incurred to increase range conditions produce more forage for both domestic livestock and wildlife. Benefits to wildlife are included in recreation benefits through increases in hunting and wildlife viewing caused by improving wildlife habitat. Returns to treasury are moneys collected through the sale of timber, grazing fees, and fees charged for developed recreation and special uses. Benefits include all such moneys as well as estimates of the value to the public of nonmarket goods and services such as dispersed recreation. Fees from mineral leasing are not included in either returns to treasury or benefits.

The differences between alternatives and even the ranking of alternatives would be different and more extreme if economic costs and benefits of mineral development were included. Not shown in these or subsequent tables is the approximately 1.1 million dollars generated annually from current oil and gas leases on the Forest. Income from these leases is collected by the Bureau of Land Management and was not used in calculation of total discounted benefits. Further, this income to the U.S. treasury exceeds all other revenues generated on this Forest. Because the Plan does not effect current leases and because all alternatives provide the same number of acres available for leasing, the income generated through lease fees in all alternatives would be the same.

At the present time there are no known geological structures for oil and gas production that have been proven on the Forest. Because of this, there was no attempt to estimate possible production levels of oil and gas and the revenues to the treasury and State of Wyoming that would be generated by such production. However, to include oil and gas considerations in analysis and to display relative differences between alternatives, a method for estimating the lease bid values by alternative was developed and used. This analysis procedure and results of the procedure are displayed in Appendix D. In short, this procedure attempted to estimate the value of leases based on the stipulations and operating standards that would be recommended under each alternative (see minerals discussion in Chapter IV and Appendix D for more detail).

This analysis, in general, shows that all alternatives except C and D result in lease values at or near their maximum. Of the remaining two, Alternative D is significantly higher than C. If added into the total PNV calculations, ranking of alternatives would change somewhat. In this case, Alternative A would follow the commodity alternative and its PNV would be greater than the Preferred. Next would follow the Preferred and then much further behind would be Alternative E and then C.

The reason for this result in terms of the value of leases is due to the stipulations and operating standards that would probably be recommended for oil and gas exploration and development. This is an illustration of a point discussed earlier. The quantified measure of areas available for leasing remains the same for all alternatives. This could be interpreted as if oil and gas leasing and production were either ignored in planning or were of such a significance that they overrode all other values. Neither was the case. Given legal restrictions, it appeared that there was little legal justification for excluding oil and gas leasing on any portion of the acres available. However, there are reasons for controlling leasing and development so that each can be done in harmony with management of other resource values within each alternative. This is accomplished through application of alternative sets of stipulations and probable operating standards. Comparing quantitative measures for alternatives does not display these differences well.

Comparison of Alternatives in Terms of Net Cash Flow

A ranking of alternatives in terms of net cash flow showing cash receipts and noncash benefits is shown in Table B-8. Net cash flow was calculated by subtracting cash receipts estimated for each alternative from the total budget cost of each alternative. The rankings of alternatives in these terms is much different than ranking them by PNV. Further, the relationship between market and nonmarket production possibilities on this Forest are illustrated.

TABLE B-8

Ranking of Alternatives By Net Cash Flow (Millions of Dollars)

Alternative	First Decade				Fifth Decade			
	Net Cash Flow	Total Cost*	Cash Receipts**	Nonpriced Benefits***	Net Cash Flow	Total Cost*	Cash Receipts**	Nonpriced Benefits***
E Reduced Budget	-1.915	2.201	.286	14.01	-1.87	2.178	.308	17.98
F RPA	-3.839	4.598	.759	18.94	-3.466	4.251	.785	22.01
C Noncommodity Emphasis	-3.923	4.507	.584	18.69	-3.569	4.232	.663	21.73
B Commodity Emphasis	-3.923	4.77	.847	18.94	-3.609	4.475	.866	22.07
D Preferred	-3.946	4.708	.762	18.85	-3.587	4.386	.799	21.94
A Current Direction	-4.088	4.87	.782	18.88	-3.751	4.572	.821	21.92

* Costs are agency or taxpayer expenditures and do not include payments to Counties and expenditures by cooperators.

** Cash receipts are income from timber sales, grazing fees, developed recreation, and special uses such as lodges, ski areas, and outfitters and guides; they do not include cash income from mineral leasing estimated at $1.1 million per year.

*** These values do not include $164.2 million of nonpriced benefit from water which would be produced without any active management of the Forest.

Cash receipts to the Forest, shown in Table B-8, include stumpage prices paid for timber, grazing fees paid by those grazing domestic livestock on the Forest, and fees charged for developed recreation including fees paid by commercial operators including lodges and outfitters and guides. Lease fees for oil and gas were not included because these fees are not collected by the Forest and as such are not part of the cash flow of the Forest. Of the fees charged, only those for timber represent the full dollar value to the American public of these outputs. Grazing fees, set by Congress, represent the difference between the full value to the public of grazing and costs incurred by permittees. To account for that in analysis, the difference between fees charged and the total value to the American public were included in analysis as part of the nonmarket production benefits. Similarly, fees charged for developed recreation fall short of the total value to the American public of these outputs. These values were included as part of the nonmarket production benefits. Nonmarket production benefits also included benefits derived from dispersed nonwilderness recreation, wilderness recreation, hunting, fishing, and production of water above that which would be produced naturally.

The ability of the Forest to produce market outputs is very limited. Only about 6 percent of the Forest is capable of growing commercial crops of trees and of that only 3 percent to 4 percent can produce timber in an economically efficient manner. Similarly, only about 17 percent of the Forest is suitable for grazing of domestic livestock with about 5 percent of that occuring in winter range deemed crucial for supporting wildlife. These facts, plus a relatively low demand for developed recreation, mean that total receipts collected for these outputs cannot and do not cover the entire cost of managing the approximately 2.5 million acres of the Forest.

Given these facts, it is impossible for the Forest to produce a positive cash flow when comparing direct receipts collected and total management costs. This could change if oil and gas is discovered on the Forest and receipts from such production are included in the cash flow calculation. The general trend in ranking of alternatives by cash flow is directly correlated with the budget, the smaller the budget the higher the net cash flow.

Two exceptions to this trend can be found, Alternatives F and B. Both focus on producing high amounts of commodities at the least possible cost. Alternative F is the most efficient in this respect and its increase in cost is more than compensated by increase in cash receipts when compared with other alternatives. Alternative B has only a slightly higher budget than Alternative D, but again receipts produced by the higher overall commodity production of Alternative B more than compensate for this slight increase in cost during the first decade. Projections out through the fifth decade show that by the fifth decade, the cash flow of Alternative B drops below that of Alternative D. This is because the intent of Alternative D was to move toward the desired management system of the Forest at a quicker rate and thus incurrred slightly higher costs in the first decade.

The realtionship between PNV, cash flows, and noncash benefits is shown in Table B-9. From this table, it is clear that the noncash benefits derived through management of the Forest greatly exceed both the budgets from all alternatives and the cash flow deficits of all alternatives. This illustrates the point that the Forest and its management are valuable to the American public for such things as the total benefit from grazing of domestic livestock, recreation, and wildlife.

TABLE B-9

Comparison of Present Net Value, Net Cash Flow, Noncash Benefits, Employment, and Income

Alternative	Billion$ PNV	Million$ Net Cash Flow		Million$ Noncash Benefits*		Forest Dependent Employment (Number of Jobs)	Total Income to Economic Impact Areae (Million Dollars)
		1st Decade	5th Decade	1st Decade	5th Decade		
F RPA	419.1	-3.839	-3.466	18.94	22.01	1227	16.22
B Commodity Emphasis	416.6	-3.923	-3.609	18.94	22.07	1269	16.91
D Preferred	409.3	-3.946	-3.587	18.85	21.94	1244	16.48
A Current Direction	407.1	-4.088	-3.751	18.88	21.92	1185	15.67
C Noncommodity Emphasis	406.8	-3.923	-3.569	18.69	21.73	1221	15.90
E Reduced Budget	394.	-1.915	-1.87	14.01	17.98	921	11.52

* These values do not include 162.2 million of nonpriced benefit from water which would be produced without any active management of the Forest.

Commodity production of timber and grazing of domestic livestock more than pay for themselves as shown in Table B-7. Here costs and benefits directly attributable to these two areas of production show benefit/cost ratios of 2:1 to 3:1 for timber and up to 20:1 for grazing of domestic livestock. When looking at all economic indicators including impacts on local economies, it appears that producing a mix of outputs which produce cash flows and noncash outputs maximizes economic benefits to society. The question, then, becomes a value judgement as to which mix is best, taking economic, environmental, and social effects into consideration.

Major Tradeoffs Between Alternatives

Each alternative is designed to address issues and concerns differently. Complete understanding of differences between alternatives can be gained only by studying all of Chapter II and IV as well as such appendices as A, B, D and F. A summary of comparisons between alternatives touching on major differences can be found in Table II-4. The purpose of this section is to discuss differences between alternatives in terms of economic indicators including PNV, cash flows, costs and benefits of major program areas, and economic impacts as well as to summarize reasons for significant differences in these indicators. This is presented as a portion of the overall discussions of this Chapter to summarize differences between alternatives.

The primary reference for this discussion is Table B-7. This table displays the ranking of alternatives in terms of PNV, benefits of major program areas and variable costs involved directly attributable to each area. Fixed costs in terms of general administration costs, costs for offices and equipment, and overall program management costs are not included. These costs are constant or nearly so for all alternatives and inclussion of them would mask real differences between alternatives. Even though costs directly attributable to each major program area are displayed, caution should be excercised when studying them. Many of these costs are for practices which produce multiple-use outputs. For example, one cost attributed to the timber program is timber sale preparation. In alternatives such as C and D, these costs include careful design of harvest blocks to maximize beneficial effects on wildlife and visual diversity. Therefore, such costs are not pure timber costs, but relate to wildlife and recreation as well.

When comparing alternatives, there are no significant differences in terms of PNV, the largest being a 6 percent decrease for the reduced budget alternative. This is due to the fact that all alternatives produce anticipated recreation use at or near the maximum that will be consumed given demands for recreation (wildlife are valued through their recreational value for hunting, fishing and viewing). Recreation (and therefore wildlife) values produced on the Forest comprise about 92 percent of the benefit values of management. Because quantifiable recreation benefits do not change significantly by alternative, the fact that they comprise 92 percent of the benefit values means that PNV cannot change significantly between alternatives no matter how much of other goods and services are produced. Significant differences between alternatives are in the quality of production in terms of how, where, and when practices are applied.

Alternative F. The PNV of this alternative is essentially the same as the maximum PNV benchmark (it is 0.4 percent less). This alternative responds to issues and concerns related to meeting the Forest's share of national production of goods and services as disaggregated through the program dictated by the Resource Planning Act of 1974. This includes meeting production targets for dispersed and developed recreation including wilderness recreation, wildlife habitat, timber outputs, and grazing of domestic livestock. The focus of this alternative is to meet these goals in the most cost efficient manner possible.

Differences between this alternative and the maximum PNV benchmark include a slight increase in both timber and grazing of domestic livestock. Doing this while meeting the same amount of recreation and wildlife outputs involved slight increases in costs of both of these areas. The increase in net cash flow generated by timber and grazing were not large enough to compensate for increased costs of the multiple-use management strategies selected to efficiently meet the total set of targets for all goods and services.

A major set of issues on the Forest relate to how commodity production effects wildlife and recreation. The cost efficiency orientation of this alternative called for minimum standards for timber harvest, road construction and maintenance, and oil and gas exploration and development. This means that though the quantifiable production levels of such goods and services such as recreation and wildlife were met within this alternative, the manner in which they were met did not address this major set of issues well. Given that much of this Forest is within the greater Yellowstone area and as such is of National interest in terms of wildlife and recreation, not meeting this set of issues appeared to be a significant flaw of this alternative.

Alternative B. The PNV of this alternative is 0.5 percent less than the maximum PNV benchmark. It was formulated to respond to issues and concerns calling for increased timber harvest, more grazing of domestic livestock, minimum restrictions on oil and gas exploration and development, and meeting maximum demands for developed recreation.

In this alternative, timber and forage for domestic livestock were produced at near their maximum level. Coordinated management strategies necessary for such levels of production required increased road construction and maintenance when compared with the maximum PNV benchmark. Also there were increases in Forest Service costs of managing timber, range, and facilities for recreation. These increases in cost exceeded the increase in revenues and benefits generated by higher production of the selected goods and services.

The results of this alternative provided the maximum impact on local economies in terms of both jobs and income produced. So not only did this alternative address issues and concerns related to higher production levels of commodity oriented goods and services, it favorably addressed issues and concerns related to community stability and moderate growth as well.

Likewise, the standards and guidelines for production of timber, grazing of domestic livestock, and oil and gas exploration and development were at the minimum necessary to meet minimum standards for impacts on soil, water, air and wildlife. Therefore, like Alternative F, this alternative did not address well issues and concerns dealing with the impacts of these activities on recreation, visual quality, and wildlife. Increases in production of these outputs, though meeting minimum water and air quality standards, increased the risk that an accident in support of production could violate such standards. Further, because range management intensified, costs of maintaining range structures imposed on permittees increased in this alternative. In some cases the increase allowed a permittee in terms of cattle AUMs did not provide sufficient revenues to cover their increased range management costs.

Alternative D. The PNV of this alternative is 2.3 percent less than the maximum PNV benchmark. It was formulated to respond to issues and concerns related to production of high quality, low density recreation; high quality wildlife habitat; and low risk to air, soil and water resources. It was also formulated to meet historic demand levels of timber; forage for domestic livestock; developed recreation including outfitters and guides; and allow for oil and gas exploration and development to the maximum extent possible while meeting objectives for recreation and wildlife habitat.

When compared with the maximum PNV benchmark, this alternative produces slightly less than 4 percent more timber in the first decade. This production was made possible by slight increases in road needs of the multiple-use management strategies chosen. Production of forage for domestic livestock is about 1 percent less than the max PNV benchmark but shifts slightly toward more cattle rather than domestic sheep. The combination of shifts for timber and range mean that variable costs for these programs go up while increases in timber benefits are almost identical to decreases in range benefits. Net change then is a slightly lower PNV for these two program areas.

In addition to this are increases in both road construction/reconstruction costs and road maintenance costs. These are incurred to provide better access to the Forest in response to issues calling for better access and lower density of recreation users. Similarly, there are increases in costs for recreation facilities including trail heads and trails. Again, this is in response to issues calling for greater dispersion of recreation users and provision of higher quality recreation experiences.

Conversely, recreation operation and administration costs drop somewhat. The reason for that is that this alternative provides more pristine and primitive wilderness recreation than any other alternative. Again, this is an attempt to meet issues calling for high quality, low density recreation. Because of this shift in recreation opportunities, recreation administration costs go down in response to the lower costs of managing these areas for this type of recreation experience.

These are the most significant changes in the quantifiable measures of alternatives displayed in this Chapter. Other points of note in terms of meeting issues and concerns include: standards and guidelines for timber management; road management strategies; and stipulations and operating standards that will be recommended under this alternative for oil and gas leasing, exploration and development.

The forest condition selected as the target for even-age timber management in this alternative includes keeping harvest blocks to 25 to 35 acres in size. Further, they call for a dispersion of harvests and maintenance of cover surrounding cut blocks. This forest condition was chosen for it maximizes the beneficial effect of timber harvest on wildlife, provides high quality edge, and provides for quality visual diversity. From a timber management standpoint, this also provides a mosaic of age classes that will be less susceptible to catastrophic insect and disease attacks.

As stated, this alternative requires more roads than the max PNV benchmark. These roads are necessary to provide access to the Forest for recreation, range management, wildlife management, and timber management. Roads open to the public particularly in wildlife winter range can be detrimental to wildlife. To mitigate this in terms of the intent of this alternative, this alternative calls for seasonal closures of more road miles than any other alternative. This type of management is slightly more expensive than leaving those roads open. This decreases total PNV slightly.

As in all alternatives, all acres currently available for oil and gas leasing are available in this alternative. However, stipulations and operating standards for leasing, exploration and development are tailored to blend such operations into the management intent of this alternative. This is done on an analysis area by analysis area basis depending on the management strategy selected for each area and the types of land (crucial preferred winter range, high hazard to soil and water, etc.) within each analysis area. (This is displayed in the minerals discussions in Chapter II and IV of this document and Appendix J and K of the Plan.)

By producing timber, developed recreation and forage for domestic livestock at or slightly above historic levels while emphasizing high quality recreation and wildlife habitat, this alternative provides for stability of local economies. This addresses issues and concerns related to maintaining such stability.

Alternative A. The PNV of this alternative is 2.8 percent less than that of the maximum PNV benchmark. This alternative was formulated to portray what would happen if the direction in existing plans and policies were implemented.

Timber production in this alternative is the second highest of all alternatives falling behind only Alternative B. In this case the added timber benefits outweigh added timber costs which provide a marginal increase in PNV. By providing timber at a level slightly higher than historic levels, this alternative addresses issues surounding increased timber harvest and support for timber-based employment. This increase in timber production comes with a slight increase in acres suited for timber management. This occurs in areas of low productivity lodgepole pine and would slightly enhance the Forest's ability to deal with current insect and disease problems. However, standards for timber harvest would not be as oriented toward maximizing wildife benefits from such operations as in alternatives C or D. Further, the increase in road costs necessary for this increase in harvest are greater than the increase in net timber benefit.

Production of forage for domestic livestock is about the same as for the maximim PNV benchmark as are costs and benefits. This would be enough to support historic levels of grazing on the Forest, so this alternative favorably addresses such issues. Further, this alternative includes fairly intensive range mangement and when coupled with wildlife improvements included in this alternative, the net effect would benefit wildlife. Additional costs in these areas are incurred to address issues and concerns surrounding quality wildlife habitat with some minor localized exceptions.

Recreation benefits are slightly less for this alternative than for the maximum PNV alternative. However, costs for maintenance of facilities and trails are higher. This means that probable recreation use is less than the maximum that will be demanded and that the quality of facilities and experience will generally be high. These costs are incurred to address issues and concerns calling for provision of high quality recreation experiences.

Treatment of oil and gas issues in this alternative is very similar to their treatment in Alternatives B and F. There are some areas on the Forest, particularly crucial winter ranges, where the standards for oil and gas operations are similar in this alternative to ones in Alternatives C and D. This means that the decreases in lease values and PNV shown in Appendix D for such operations are related to an attempt to addresses issues for tailoring such operations to the wildlife, recreational and visual values of this Forest.

Economic impacts of this alternative show little difference from others because of timber, range and recreation outputs produced. This alternative would provide for slight growth in local communities.

Alternative C. The PNV of this alternative is 3 percent less than that of the maximum PNV benchmark. This alternative was formulated to address issues and concerns calling for less timber harvest; less grazing of domestic livestock with more forage available for wildlife; and more restrictions on oil and gas leasing, exploration, and development. It was also formulated to meet demands for more recreation including better access to the Forest for recreation without timber harvesting along roads built for recreation.

As a result of attempting to meet these issues and concerns, timber harvest dropped below historic levels and planned harvest are 25 percent below that of the maximum PNV alternative. This decreased both timber costs and benefits with a net decrease in PNV of about a billion dollars over the life of the plan directly attributable to changes in timber. Similarly there was about a 28 percent decrease in forage for domestic livestock accounting a decrease in PNV of about 5 billion dollars. Because all alternatives produced about the same recreation benefits, increasing emphasis on recreation did not offset these losses to PNV.

Under this alternative, forage available for wildlife increased significantly. However, most of this increase occured in summer range where there was already ample summer range available to support herd unit targets for the Forest. All alternatives provided protection of crucial wildlife winter range and most met herd unit targets over the Forest with one exception. That one exception (the North Fork elk herd unit) could not be provided for in any alternative. Therefore, there were no increases in wildlife benefits to offset the losses in PNV caused by decreasing forage for domestic livestock.

This alternative contained the same standards for timber harvest as Alternative D. Thus timber harvest under this alternative would be designed to maximize beneficial effects on wildife. The decrease in harvest in this alternative, however, would cause this effect to be less than that of Alternative D.

Also like Alternative D, this alternative contained stipulations and operating standards for oil and gas leasing , exploration and development that are more stringent than those in other alternatives. These more stringent standards were incorporated forest-wide rather than being based on management strategies for each area of the Forest. This was in response to issues relating to a need for more stringent control on such activities forest-wide given the Forest is part of the greater Yellowstone area. Like Alternative D, this would lessen risk to air, soil and water as well as mitigate effects on recreation and wildlife. However, imposition of these standards forestwide had a significant effect on lease values and PNV associated with oil and gas, dropping both significantly.

Because this alternative produces timber and forage for domestic livestock at a levels lower than historic levels and because all alternatives provide enough recreation opportunities to meet demand, this alternative would have a tendancy to destabilize local economies. There would be no increase in recreation related jobs to compensate for jobs and income lost in areas related to timber and ranching. Over the entire economic impact area, the significance of this is minor. However, in some of the small communities adjacent to the Forest, this could have a significant effect causing a downturn at least over the next five to ten years.

Alternative E. The PNV of this alternative is 6 percent less than that of the maximum PNV benchmark. This alternative was formulated to respond to issues and concerns associated with the possibility of budget reductions. It portrays one possibility that could occur if the budget was reduced to 75 percent of the 1982 fiscal year budget.

Decreases in PNV are related to an across the board decrease in production of all goods and services. Timber production drops by almost 72 percent from the maximum PNV benchmark. Forage for domestic livestock is reduced by almost 60 percent while recreation benefits fall by almost 11 percent. The decreases in costs for these outputs are not compensated for by these sharp decreases in production levels.

Even though recreational benefits are 90 percent of their maximum, the associated decreases in costs for maintenance of facilities and trails coupled with decreased costs of operation and administration mean that the quality of recreation will decrease from current levels. This quality will be significantly below the quality provided in other alternatives such as C and D. Thus this alternative does not address issues and concerns calling for high quality recreation experiences. Further, the decreases in road construction and maintenance means that access problems will not be resolved and the attractiveness for motorized recreation including driving to a trailhead will decline.

Similarly, decreases in range management and timber management will adversely effect the ability of the Forest to provide quality wildlife habitat. The majority of increases in forage will be on summer range where there is already enough to support herd unit targets. Decreases in timber harvest will mean that the small amount that could be done to improve spring-fall range through appropriate timber harvest will be curtailed. Thus this alternative does not favorably address issues and concerns dealing with provision of quality wildife habitat and may mean a slow decline in current wildlife population levels. Issues and concerns regarding meeting historic demands for timber and forage for domestic livestock will not be favorably addressed in this alternative. Most mills and many dependent ranchers will be effectively put out of business.

This alternative allows for oil and gas leasing, exploration, and development with standards to meet minimum legal requirements. From this standpoint, it addresses favorably issues and concerns that call for the fewest possible restrictions on such operations. But as with Alternatives A, B, and F, it does little to address concerns about tailoring such activities in recognition of the visual, recreation, and wildlife resource values of the Forest. Economic impacts of this alternative are the most significant of all alternatives given significant decreases in timber, range, and recreation. There would be companion decreases in jobs and income in industries related to these outputs.

Economic Impact Effects

In order to estimate impacts on local economies and population, IMPLAN, an economic input/output model was used. This was done for the two economic impact areas for the Forest represented by Park County and Fremont County, Wyoming. Data used included the standard IMPLAN database of secondary information coupled with primary data to include outfitters and guides as a separate sector.

Table B-10 displays the economic impacts of alternatives in terms of changes in: population in each economic impact area; income by wage earners (personal income); income of property owners (property income); total income, Forest related jobs; and unemployment.

The ranking of alternatives in terms of beneficial economic impacts is the same by county. In both counties Alternative B is best and then D, F, C, A and E. Changes in all indicators follow this ordering with one exception. That exception is Alternative C in the northern economic impact area. This alternative had much less of an impact on unemployment than all other alternatives except E in this impact area. The reason for this is that the job skills needed in the economy in support of this alternative are already near full employment. This means that a proportionately larger in-migration of workers was needed and fewer unemployed people in the local area were able to find employment.

Relative economic impacts followed the same pattern as relative PNV. That is, those alternatives which produced more market outputs tended to have greater economic impacts. Again, all alternatives provide all or nearly all recreation capacity necessary to meet all demands. Thus there is little or no difference between alternatives in terms of supporting local recreation based sectors of the economy. The areas of difference between alternatives appears to be in those sectors related to and supporting timber industries and ranching.

Currently, most local economies are suffering losses because of a general decline in oil and gas activities off of the Forest. Compounding this are losses in other energy-related sectors and mining sectors within the southern economic impact area. With recreation at or near its maximum on the Forest, the only sectors which can aid these depressed economies are those related to timber and ranching. If a large oil and gas field is discovered on the Forest, this too could aid in economic recovery.

Another impact from Forest management on local economies are payments made to counties. Table B-11 displays the budget expenditures and returns to the treasury for each alternative for the next 5 decades. Payments to counties amount to 25 percent of the returns to the treasury. Impacts in terms of such payments follow the same trend as economic impacts on jobs and total income. That is, alternatives which produce more commodity outputs will have more impact on counties in terms of payments.

TABLE B-10

Forest-Related Population, Employment and Income Impacts

	Population	Personal Income (Million Dollars)	Property Income (Million Dollars)	Total Income (Million Dollars)	Jobs (Number of Jobs)	Unemployment (Percent)
Fremont Economic Impact Area						
Total	33,637	108.99	69.	177.99	9516	4
Forest-Related (1977 Base)	429	2.28	1.44	3.73	284	-
Changes from Forest-Related Base by Alternative (1990 Index Year)						
B	+750	+2.14	+1.36	+3.49	+277	-.68
D	+710	+2.02	+1.27	+3.28	+265	-.67
F	+692	+1.96	+1.24	+3.2	+259	-.66
C	+677	+1.87	+1.13	+2.99	+253	-.65
A	+624	+1.8	+1.15	+2.94	+238	-.64
E	+294	+ .72	+ .34	+1.05	+117	-.34
Park Economic Impact Area						
Total	12,600	70.28	108.1	178.3	6701	3.84
Forest-Related(1977 Base)	246	2.48	1.57	4.06	290	-
Changes from Forest-Related Base by Alternative (1990 Index Year)						
B	+710	+3.37	+2.27	+5.64	+419	-.60
D	+686	+3.24	+2.17	+5.42	+406	-.60
F	+666	+3.13	+2.11	+5.24	+395	-.60
C	+670	+3.12	+2.01	+5.13	+395	-.54
A	+626	+2.94	+2.01	+4.95	+374	-.60
E	+392	+1.69	+1.00	+2.69	+231	-.32

TABLE B-11

Average Annual Expenditures and Returns to the U.S. Treasury
(In Millions of 1982 Dollars)

	Alternative					
	A	B	C	D	E	F
Decade 1						
Budget Expenditures	4.87	4.77	4.51	4.71	2.20	4.60
Returns to Treasury	.782	.847	.584	.762	.286	.759
Decade 2						
Budget Expenditures	5.08	5.07	4.83	4.97	2.55	4.78
Returns to Treasury	.771	.840	.647	.758	.304	.750
Decade 3						
Budget Expenditures	4.78	4.57	4.49	4.61	2.32	4.38
Returns to Treasury	.825	.877	.662	.799	.305	.787
Decade 4						
Budget Expenditures	4.46	4.50	4.24	4.33	2.25	4.25
Returns to Treasury	.825	.890	.667	.807	.317	.792
Decade 5						
Budget Expenditures	4.57	4.48	4.23	4.39	2.18	4.25
Returns to Treasury	.821	.866	.663	.799	.308	.785

IMPLEMENTATION AND MONITORING

FORPLAN prescriptions as discussed in this appendix and depicted for the Plan in Appendix J of the Plan, are coordinated, multiple-use mini-plans for analysis areas. This provides Rangers on each District a listing of what is to be done on each analysis area by decade. Because analysis area boundaries often coincided with administrative boundaries (e.g. range allotment boundaries), it is easy to identify where practices listed in a prescription are to be implemented. This is further aided by the numerous maps and map overlays developed as part of the forest planning data base that show timber stands, suitable range, crucial preferred winter ranges, roads, trails, facilities, areas for sage treatment, areas for aspen treatment, high quality riparian areas, etc., all by analysis area. In other words, the practices within a FORPLAN prescription identifies what is to be done; the schedule within the prescription identifies when it is to be done for non-timber management practices; the schedule developed by FORPLAN for timber management practices identifies when these practices are to occur; and the maps of timber, range, etc. by analysis area identify where practices are to be applied. This means that the basic focus for implementation planning is to decide what part the Forest Plan for the first decade will be implemented each year within that decade.

As discussed throughout this appendix, development of prescriptions to permit this level of site specific analysis provided a mechanism for estimating costs of practices and their effects by various land and ecosytem types within an analysis area. Coefficients were not forest-wide averages, but were tailored to the specifics of each analysis area on an analysis area by analysis area basis. All estimates of production levels and major effects are included in each FORPLAN prescription. This will facilitate monitoring as implementation occurs by being able to track what was supposed to happen based on the FORPLAN prescription being implemented versus what actually did happen when those practices were applied as planned.

APPENDIX C

Determination of Lands Tentatively Suitable for Timber Production and Economic Efficiency Analysis of Lands Tentatively Suitable for Timber Harvest and Production

APPENDIX C

DETERMINATION OF LANDS TENTATIVELY SUITABLE FOR TIMBER PRODUCTION AND ECONOMIC EFFICIENCY ANALYSIS OF LANDS TENTATIVELY SUITABLE FOR TIMBER HARVEST AND PRODUCTION

DETERMINATION OF LANDS TENTATIVELY SUITABLE FOR TIMBER PRODUCTION

Lands tentatively suitable for timber harvest during this planning effort were originally identified using the process described in the planning regulations (Section 219.12) of the September 17, 1979, Federal Register (Vol. 44, No. 181). These regulations described a process for determining lands that are capable, available and tentatively suitable for timber production and harvesting. On September 30, 1982, the regulations were revised and the major difference regarding indentification of suitable acres was that the term "capable" was eliminated. Capable lands were those which produced at least 20 cubic feet of wood per acre annually. Under the new regulations, all available forested lands are to be considered for timber production and harvest. Figure C-1 shows the process used, which is consistent with the regulations of September 30, 1982, and the following is an explanation of the various categories shown in the Figure.

DESCRIPTION OF PROCESS CATEGORIES

A. IS LAND FORESTED - Forested land is at least 10 percent occupied by forest trees of any size, or formerly having had such tree cover.

B. IS LAND WITHDRAWN FROM TIMBER PRODUCTION - Not available lands are those productive forest lands that have been legislatively or administratively withdrawn from timber production. This classificatin includes wilderness areas, research natural areas, wild and scenic river corridors, powerline corridors and administrative sites such as campgrounds.

C. IS LAND CAPABLE OF PRODUCING CROPS OF INDUSTRIAL WOOD - Lands that cannot produce crops of industrial wood are classified as unsuitable for timber production. Species of trees which are not currently utilized, or not expected to be utilized within the next ten years, constitute the criterion for assigning lands to this category.

D. IS IRREVERSIBLE DAMAGE LIKELY TO OCCUR - Forest lands physically suitable for timber production are lands where technology is available to ensure timber production without irreversible resource damage to soils, productivity, fish or wildlife habitats, or watershed conditions. Availble technology is that technology that is in use or which current research and experience indicates is feasible to use. Current research and experience should indicate that the technology is feasible to use successfully for the site, species and other factors involved and does not have to be available locally. As a minimum, the factors considered should include access, harvesting, slash disposal and regeneration. If these items can be accomplished with available technology and without impairment to the site or drainge, the land shall be considered tentatively suitable.

E. CAN AREA BE RESTOCKED WITHIN FIVE YEARS - The second criterion for physical suitability is to determine whether there is is reasonable assurance that harvested forest lands can be adequately restocked within five years based on existing technology and knowledge. Current research and experience shall be the basis of determining whether the practices planned are expected to be successful at the time of final harvest. Such assurance applies to normal conditions for the site, but abnormal conditions such as drought, disease or other unplanned events may preclude meeting this requirement. Forest lands failing to meet this test are classed as unsuitable for timber production.

F. IS ADEQUATE RESPONSE INFORMATION AVAILABLE - Forest land is classified as unsuitable for timber production if there is not adequate information available, based on current research and experience, to predict responses to timber management practices. These lands are identified as needing further inventory, research or information, and are not considered part of the tentatively suitable land base until adquate response data are available.

G. THEN LAND IS TENTATIVELY SUITABLE FOR TIMBER PRODUCTION - Forest lands that meet all the above criteria are finally classified as tentatively suitable for timber production.

H. IS LAND SELECTED IN ALTERNATIVE FOR TIMBER PRODUCTION - Of the lands identified as tentatively suitable, economic considerations were used to help identify lands actually suitable for timber production in the various alternatives. These were defined as lands that were cost-efficient in meeting timber production goals for the respective alternatives. Such lands were identified by using FORPLAN to select analysis areas where timber management would be applied. (More detail on economic efficiency of tentatively suitable lands is in the next section.)

A tabulation of Forest acres and the catagories they fall in, including tentatively suitable timberland is shown in Table C-1. The timberland base used for the 1976 Timber Management Plan on the Forest was 93,600 acres. This means that 51,082 acres were added for consideration for timber management since 1976. These additions include lands with slopes of 40 percent to 60 percent, lands with productivity of less than 20 cubic feet per acre per year, and lands on which there was insufficient data in 1976.

A comparison of acres allocated to timber production under the proposed Plan and under the 1976 Timber Management Plan appears in Appendix D, proposed Forest Plan.

PROCESS FOR IDENTIFICATION OF LANDS SUITABLE FOR TIMBER PRODUCTION

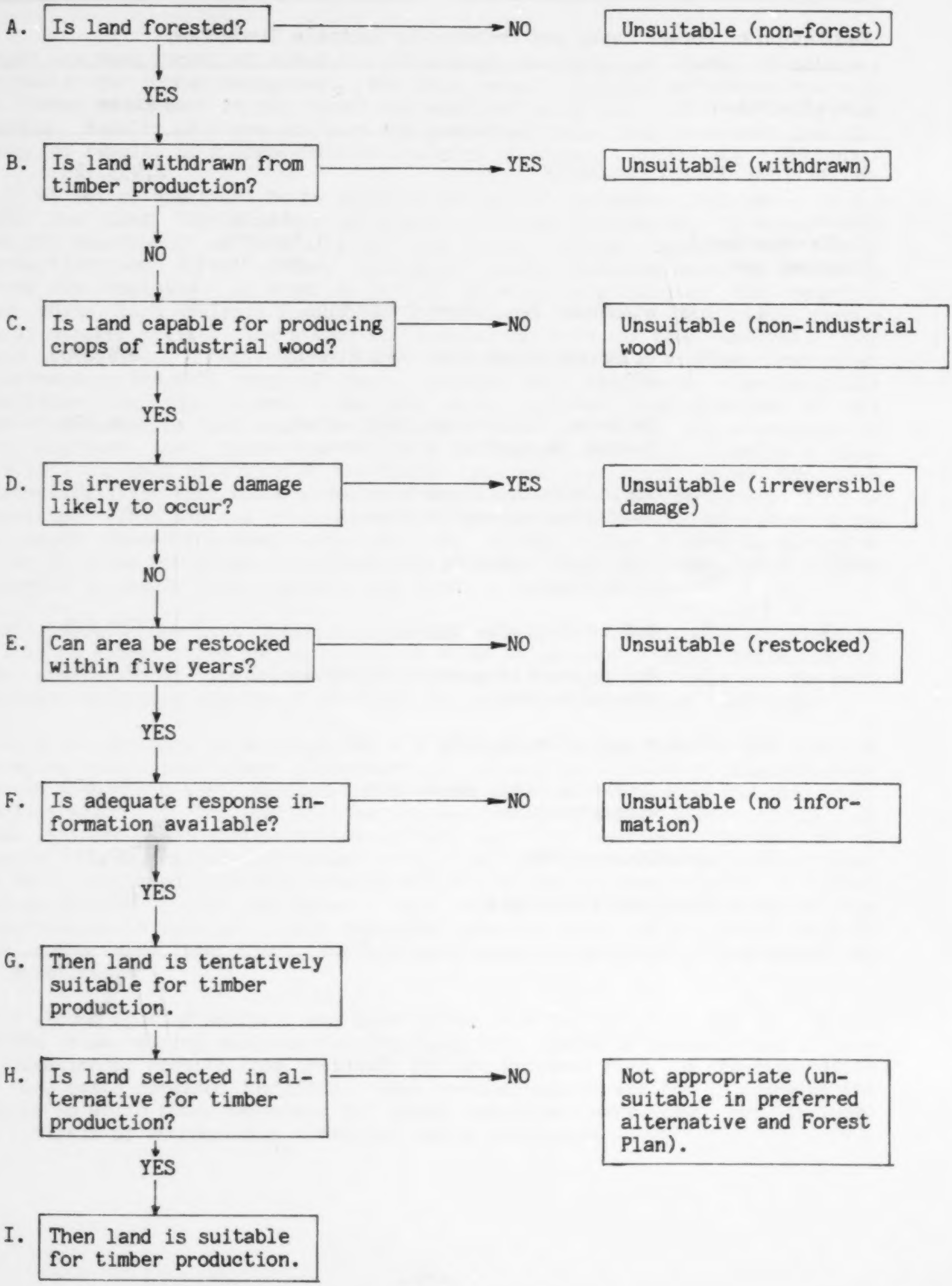

A.
Is land forested?
NO
Unsuitable (non-forest)
YES
B.
Is land withdrawn from timber production?
YES
Unsuitable (withdrawn)
NO
C.
Is land capable for producing crops of industrial wood?
NO
Unsuitable (non-industrial wood)
YES
D.
Is irreversible damage likely to occur?
YES
Unsuitable (irreversible damage)
NO
E.
Can area be restocked within five years?
NO
Unsuitable (restocked)
YES
F.
Is adequate response information available?
NO
Unsuitable (no information)
YES
G.
Then land is tentatively suitable for timber production.
H.
Is land selected in alternative for timber production?
NO
Not appropriate (unsuitable in preferred alternative and Forest Plan).
YES
I.
Then land is suitable for timber production.

TABLE C-1

Tabulation of Forest Lands and Tentatively Suitable Timberlands

Classification		Acres
NET NATIONAL FOREST OWNERSHIP		2,433,125
Water	11,746	
Nonforested Land	1,120,275	
Forested Land	1,301,104	
A. Land Withdrawn for Timber Production		
1. Reserved; Wilderness, W&S Rivers, RNA's		258,000
2. Deferred; wilderness study areas, Special Management Unit (Dunoir)		14,600
3. Administratively not suitable (developed recreation sites)		1,381
B. Not Capable of Producing a Crop of Industrial Wood		
1. Not merchantable type		501,627
2. Not capable of supporting commercial stands of trees		152,082
C. Irreversable Damage Likely to Occur		
1. Technologically unsuitable (inaccessible)		130,820
D. Insufficient Data		97,912
E. Tentatively Suitable		144,682

ECONOMIC EFFICIENTY ANALYSIS OF LANDS TENTATIVELY SUITABLE FOR TIMBER HARVEST AND PRODUCTION

There are many facets of economic efficiency analysis of lands tentatively suitable for timber management. For this reason, economic efficiency analysis of timber management on the Forest was analyzed using two different analytical models. Results of these analyses are presented here. They represent the full range of results of a comprehensive analysis of economic efficiency questions.

A first set of questions to be answered as part of economic efficiency deals with the long term economic efficiency of timber production. To answer this set of questions, an analysis of the direct dollar benefits of timber production and direct timber management costs including costs of necessary roads was completed. In order to provide an accurate picture of the benefits and costs, this analysis focused on the net cash flow that would result from a fully managed forest. The steady state model was used for this analysis. For this analysis, tentatively suitable land was broken into eighteen land types representing the full range of cost, benefit and management considerations available on the Forest. Analysis also included consideration of all commercial species that could be produced on each land type. (A discussion of the eighteen land types can be found in Planning Records.) Results of this analysis included selection of the timber type and management regime for each timberland type that would maximize present net value when the Forest is fully regulated. This did not include costs of conversion from existing timber types to those chosen for each timberland type. A description of each land type in terms of slope and productivity and the timber type and management regime selected in steady state analysis are shown in Table C-2.

These results show that timber management, in net, is economically efficient on all lands except those having slopes of 40 to 60 percent. Also indicated is the species that would be most efficient for each land type and the most economic efficient management strategy for that species on that land type.

This first analysis of economic efficiency focused on the benefits and costs of managing each land type independently. No spatial aspects of management or shared road costs were included. The second type of analysis included full consideration of the spatial location and juxtaposition of timber stands. It also included consideration of the current age and species distribution of timber; consideration for nondeclining flow from the present until the Forest is fully regulated; economic considerations surrounding construction of roads necessary for timber management; and economics of changing the current age distribution to that of a fully regualted forested area. This latter analysis was done using the final FORPLAN model used for analysis of benchmarks and alternatives.

This second type of analysis was done twice: once for the draft EIS and then a second time during analysis for the final EIS. Based on comments and a close examination of results from the draft EIS and Proposed Plan, a re-examination of road costs appeared justified. This re-examination resulted in changing the manner in which roads necessary for timber management were input and included in analysis of economically efficient timber management.

Results of this re-analysis changed the amount of tentatively suitable timber which are uneconomical from a timber-only benefit/cost standpoint. Earlier results indicated that 39,942 acres of timberland were not economically efficient for timber management. Through re-analysis, this acreage increased to 64,128 acres. A break down by species, productivity, and slope class of these acres is shown in Table C-3. Table C-4 shows the differences between acres which were uneconomical for timber management in the original analysis and the same type of acres which appear uneconomical in this final analysis.

In general, results of re-analysis show that more low productivity lands and steep slope lands are uneconomical from a pure timber management standpoint. Further, some areas of moderate and high productivity lands became economically efficient for timber management. The net change between these two analyses is 24,186 acres of which 17,594 acres of low productivity lands dropped out of management.

Differences Between Steady State Analysis and Final Analysis

Some lands that appeared to be economically efficient in the steady state analysis were not in the final analysis. Conversely, given shared road costs for access, 1030 acres in the 40 to 60 percent slope class that were inefficient in steady state analysis, are economically efficient in the final analysis. This means that there is no clear distinction on economic efficiency based on existing species, age class, productivity and logging costs alone. Costs of building and maintaining a transportation network effects economic efficiency for timber management.

A second major difference between results from steady state analysis and the final analysis are the management regimes selected as economically efficient. When examining timber as if it is already fully regulated and roads are already built, rotations which produced the greatest economic return tended to be longer than biological maturity. (Biological maturity is defined as culmination of mean annual increment.) Reasons for this include the economic benefits derived from thinning and the ability through intensive timber management to avoid major losses to insects and disease. When consideration of building access roads is added to analysis looking at current age classes, rotations and thinning regimes change dramatically. In this case, rotations become shorter approximating culmination of mean annual increment. This appears to be a result of trying to recover costs for roads as soon as possible. Because of shorter rotations, the amount of thinning is dramatically reduced.

In total, results of these two analyses provide a clear picture of timber management possibilities on the Forest. Both analyses show that if current stumpage prices and recent trends of stable to slightly increasing prices continues, timber management on at least a portion of the tentatively suitable timber land is economically viable. Further that during the transition period between the patterns of accessibility and current age class, rotations will tend to be short and management of moderate intensity. Once the forest begins to approach full regulation from a timber standpoint, economic efficiency would move such management toward more intense management and longer rotations. Thus over the long run, economically efficient timber management regimes will tend to provide stand structures which are less susceptible to catastrophic insect and disease problems. Also, longer rotations will mean that such management will favor a mix of edge and niches for wildlife which require early successional stages as well as for wildlife which require older stands for their habitat.

Economic Efficiency Considerations for the Preferred Alternative

Acres of timber land which are classified as suited for timber management within the preferred alternative are approximately 5000 acres more than the acreage shown as economically efficient. This results in an increase in the allowable sale quantity of about 0.4 MMBF per year. The question is, is timber management on these additional lands economically viable. The answer is yes.

As can be seen when comparing the steady state analysis, the first transition analysis, and final analysis of timber lands which maximize PNV, road costs play an important role in determination of economic efficiency. Roads were modeled in two ways in the final model. In prescriptions written for large contiguous analysis areas, roads necessary for supporting multiple-use management were identified. These roads were often necessary primarily for recreation management, but other uses such as use for range management, wildlife management, and fire suppression were also included in determination of necessary roads. The second way roads were included in FORPLAN, was in consideration of roads which were to be used for timber management only. These roads were included in the timber management portion of the FORPLAN model. Access to timber stands, therefore was a function of both types of roads. The benchmark which maximized economic efficiency (maximum present net value benchmark) was the one used to determine which timber stands were not economical from a pure timber management stand point. This benchmark chose different prescriptions for the large, contiguous analysis areas than were chosen for the preferred alternative in some cases. This resulted in a different set of multiple-use roads, providing in a few cases slightly better access to timber stands. With this better access, timber management of these stands became economically viable. This did not happen frequently, and the difference in acres of economically viable timber land is about 6 percent.

TABLE C-2

Economically Efficient Regimes at Steady State by Timberland Type

Land Type	Slope Class (Percent)	Productivity	Timber Type	Rotation	Harvest Type	Number of Thins	Acres
1	0-40	Low	Lodgepole	140	Shelterwood	1	12,894
2	0-40	Moderate	Douglas Fir	140	Shelterwood	1	5,391
3	0-40	Moderate	Spruce	120	Shelterwood	1	380
4	0-40	High	Spruce	NA	Selection		1,533
5	0-40	High	Lodgepole	160	Shelterwood	4	5,889
6	0-40	Moderate	Lodgepole	140	Shelterwood	3	17,375
7	0-40	High	Lodgepole	160	Shelterwood	4	4,762
8	0-40	Moderate	Lodgepole	140	Shelterwood	3	17,276
9	0-40	Moderate	Lodgepole	140	Shelterwood	3	13,019
10	0-40	Moderate	Lodgepole	140	Shelterwood	4	21,005
11	0-40	High	Lodgepole	160	Shelterwood	4	1,476
12	0-40	Low	Lodgepole	140	Shelterwood	1	7,574
13	0-40	Low	Lodgepole	140	Shelterwood	1	14,676
14	0-40	Low	Spruce	160	Shelterwood	4	9,976
15	0-40	Low	Douglas Fir	140	Shelterwood	1	5,118
16	40-60	Low	Lodgepole	Minimum Level			923
17	40-60	Low	Spruce	Minimum Level			1,363
18	40-60	Low	Douglas Fir	Minimum Level			4,062

TABLE C-3

Tentatively Suitable but not Economically Efficient (Acres)

Existing Timber Types	Productivity and Slope Class				
	Low 0-40%	Moderate 0-40%	High 0-40%	Low 40-60%	Total
Lodgepole Pine	25,078	17,839	37	800	43,754
Spruce	5,964	4,102	488	1123	11,677
Douglas Fir	3,428	1,374	500	3,395	8,697
Total	34,470	23,315	1,025	5,318	64,128

TABLE C-4

Difference in Tentatively Suitable but not Economically Efficient Between Draft and Final EIS (Acres)

Existing Timber Types	Productivity and Slope Class				
	Low 0-40%	Moderate 0-40%	High 0-40%	Low 40-60%	Total
Lodgepole Pine	10,783	9,566	- 542	593	20,400
Spruce	3,253	- 400	-1124	590	2,319
Douglas Fir	1,463	- 418	- 490	912	1,467
Total	15,499	8,748	- 2,025	2,095	24,186

APPENDIX D

Oil and Gas Valuation Procedure

APPENDIX D

OIL·AND GAS VALUATION PROCEDURE

The Forest and oil and gas industry representatives felt that the value of the oil and gas resources found on (or under) lands administered by the Forest should be included in the analysis process used in formulation of the Forest Plan. There is no established procedure for doing this. This appendix presents the procedure developed by Shoshone National Forest to include oil and gas values in land management planning analysis.

On a specific area of the Forest, there are alternative strategies for management. One strategy might be to emphasize commodities, in which case there might be roads, timber harvesting, range improvements, and an emphasis on less primitive forms of recreation. In this case, the activities of man are dominant in the landscape. This dominance of mans activities is compatible with the recreation experiences being offered and with the given management strategy. A second strategy might be to emphasize noncommodity values in which case there might be less roads, less timber harvest, fewer range improvements, and recreation which is freer from the sights and sounds of man. In this strategy, the activities of man are subordinate to the natural landscape. Restrictions on oil and gas operations would be different in each of the two strategies. Due to greater restrictions on operations, the second strategy will involve higher operating costs than the first strategy. When operating costs are higher, the potential value of leases on that specific area of the Forest is less.

The procedure developed attempts to capture the differences in operating costs due to varying restrictions on operations under different management strategies. The Forest Supervisor, planner, and minerals specialist met with the Rocky Mountain Oil and Gas Association (RMOGA) to review the procedure developed by the Forest. The procedure developed by the Forest is very similiar to a procedure proposed by RMOGA.

The procedure presented below was applied to all alternatives and benchmarks in the EIS. The procedure has two components: lands available for leasing and potential value of lands available for leasing. The potential value is calculated from oil and gas potentials; restrictions on operations due to soil, water, wildlife, recreation, and visuals concerns; and historical willingness-to-pay values for competitive lease sales. The lands available for leasing was controlled primarily by allocation of roadless areas to wilderness. One alternative might choose a certain roadless area to be designated as wilderness, in which case that roadless area would not be available for leasing. Another alternative might prescribe development of the roadless area, in which case those lands would be available for leasing.

Data used for this analysis:

1. For oil and gas potential - the potentials map prepared by US Forest Service and US Geological Survey ("Open File Report 81-667).

2. For soil and water hazard - soils, landform, topographic and vegetative community information developed on Forest and using procedures outlined in the "Washakie Oil and Gas DEIS" to rate hazard as prescribed by Regional Policy.

3. For willingness-to-pay values, data from BLM competitive lease sales in the general area was used. Values for each specific area are adjusted depending on the oil and gas potential of the area, land suitability for surface occupancy, and restrictions within a prescription (restrictions based on the intent of the prescription).

Example:

Assume a contiguous analysis area that contains a total of 10,000 acres equally split between high oil and gas potential and moderate potential.

Within the 5000 acres of high potential:

- 3500 acres have a slight hazard to soil and water
- 1500 acres have a severe hazard and would carry high restrictions on oil and gas operation.

Within the 5000 acres of moderate potential:

- 1000 acres are within wilderness and are thus unavailable
- 1000 acres are areas of severe soil and water hazard
- 3000 acres are areas of slight hazard

Entries of acres in a low restriction prescription, then would be:

- 1500 acres of high potential with no surface occupancy
- 3500 acres of high potential with slight hazard
- 1000 acres of moderate potential with no surface occupancy
- 3000 acres of moderate potential with slight hazard

Using these considerations, the calculation of an index value is as follows:

	High Potential (weight 9)	Moderate Potential (weight 4)	Low Potential (weight 1)	None (weight 0)
Withdrawn (weight 0) (0)	0 x 0	0 x 1000 (0)	0	0
High Restriction (weight 1)	9 x 1500 (13500)	4 x 1000 (4000)	0	0
Moderate Restriction (weight 2)	18 x0 (0)	8 x 0 (0)	0	0
Low Restriction (weight 3)	27 x 3500 (94500)	12 x 3000 (36000)	0	0

Total weighted acres = 13500 + 4000 + 94500 + 36000 = 148,000
Total weighted acres/analysis area acres = 14.8

Thus a prescription with minimum restriction on oil and gas would have an index value of 14.8 which would mean that 100% of the area in this unit that is capable of oil and gas development is available for such development.

Assume a second prescription calls for 1500 acres of the highly restricted high potential land to be recommended for wilderness and that 2000 acres of the slight hazard land of both the high and moderate potential are to be managed for wildlife winter range resulting in moderate restrictions on timing of development, then the calculations would be:

	High (9)	Moderate (4)	Low (1)	None (0)
Withdrawn (weight 0) (0)	0 x 1500 (0)	0 x 1000	0	0
High (weight 1) (0)	9 x 0 (4000)	4 x 1000	0	0
Moderate (weight 2) (36000)	18 x 2000 (16000)	8 x 2000	0	0
Low (weight 3) (40500)	27 x 1500 (12000)	12 x 1000	0	0

Total weighted acres = 108,500
Weighted acres/acre of analysis area = 10.85
Prescription index/maximum index = 10.85/14.8 = .73

Entries in the analysis model for these two prescriptions, then, would include a display of acres available for leasing and a dollar value per acre based on the index. The index in these two cases is 100 percent and 73 percent respectively. This percentage is applied to the per acre lease value of high potential land. This lease value is the value paid by bidders in BLM competitive lease sales plus the lease fee. An initial calculation of this value from lease sales in Northwest Wyoming show a value of approximately $170. per acre per decade.

Index values are used to provide a dollar value for each area for each prescription. In the example:

per acre value for prescription 1 = ($170) x (14.8/14.8) =
$170./acre/decade

per acre value for prescription 2 = ($170) x (10.85/14.8) =
$126./acre/decade

In summary, the minerals program output estimated and valued in the analysis of alternatives is oil and gas potential lease bid value. The potential lease value is a function of the potential for oil and gas development and the restrictions placed on operations. The process for determining what restrictions are appropriate for a given area under a given management strategy are presented in Appendix K of the Forest Plan, Procedure for Assigning Surface Resource Protection Stipulations to Mineral Lease Permits. The process presented here and applied to all alternatives results in a realistic valuing of what an oil and gas developer might pay for the leasing of a given tract. This approach tells us how the varying restrictiveness of each alternative affects lease values. This approach is valuable in that it allows energy minerals to be compared "value for value" with other Forest resources.

The valuation process results in the following outputs for each alternative:

	Alternative					
	A	B	C	D	E	F
	Current	Commodity	Non-Commodity	Preferred	Reduced Budget	RPA
Acres Available for Lease (Thousand acres)	977	977	977	977	977	977
Total Calculated Lease Bid Value (Million $/decade)	126	137	64.4	80.3	103	130

Lower bid values portray higher costs involved as a result of more restrictive lease stipulations on specific areas of the Forest. Table 1 shows the effects of including oil and gas lease bid values in the present net value (PNV) analysis.

Attached is a reference letter from a Forest Service minerals specialist to the Forest Supervisor, a sample of responses to meetings between the Forest Service and RMOGA, the analysis process as proposed by RMOGA, the handout distributed at the meeting between the Forest and RMOGA, and a paper entitled "Mineral Potential Report for Shoshone National Forest" including minerals potential map.

Table 1

Present Net Value Trade-off Analysis - Summary all Periods (Millions of First Quarter 1982 Dollars, 4% Discount)1/

	Benchmarks		Alteratives					
	#1 Minimum Level	#4 PNV M+A	A Current	B Commodity Emphasis	C NnCmmdty Emphasis	D Preferred	E Reduced Budget	F RPA
Disounted Cost	8.9	101	115	110	102	103	46	103
Difference from Benchmark 4	NA	NA	+13	+8.6	+0.75	+1.6	-53.9	+1.33
Discounted Benefits	4089	795	765	792	610	651	603	774
Difference from Benchmark 4	NA	NA	-30	-3	-185	-144	-192	-21
Discounted Benefits without Minerals	4089	462	460	461	454	457	355	459
Difference from Benchmark 4	NA	NA	-2.6	-1	-8	-5	-107	-3
Present Net Value	4080	694	650	682	508	548	557	671
Difference from Benchmark 4	NA	NA	-44	-12	-186	-146	-137	-23
Present Net Value w/o Minerals	4080	361	346	351	352	354	308	357
Difference from Benchmark 4	NA	NA	-15	-10	-9	-7	-53	-4
Contributions to Discounted Benefits by Resource								
Timber	0	12.3	13.7	15.0	12.6	13.3	3.42	12.5
Range	0	21.1	21.2	20.0	15.5	20.2	9.99	21.9
Recreation	121	425	421	420	421	420	340	421
Water	3968	4.30	4.65	5.69	4.61	3.58	1.94	4.30
Minerals	0	332	305	331	156	193	249	315
Total Benefits	4089	795	765	792	610	651	603	774
Total Benefits w/o Minerals	(4089)	(462)	(460)	(461)	(454)	(457)	(355)	(459)

1/ values for benchmark #4 and alternatives are incremental from benchmark #1

United States Department of Agriculture
Forest Service
Custer NF

Reference Letter from Minerals
Specialist to Forest Supervisor

Reply To: 1920 Land and Resource Management Planning
2800 Minerals and Geology

Date: March 16, 1984

KW

Subject: Oil and Gas Lease Values

To: Forest Supervisor, Shoshone NF

RM

In order to develop a way to derive a value for the oil and gas resource to be used in the Forest Planning process, I have considered three possible methodologies along with minor variations of these methods. The three methodologies are as follows:

1. Potential Production Estimates: This method would involve making estimates of what the potentially recoverable barrels of oil would be depending on the mineral potential of the area being considered and the restrictions contained in the various prescriptions. This method is not considered a viable method to use because there is not enough data available to make defendable or reliable estimates.

2. Lease Bonus Values: This method would consider the value of oil and gas leasing rather than potential production. The lease value would be derived by using a proxy lease bonus value obtained from state and private lands adjacent to the Forest and then adding to that value the total lease rental fee. A value for each of the different mineral potentials would need to be derived. Those values would then be adjusted by a percentage or some factor depending on the restrictions in the various prescriptions. This method would be difficult to use because the lease bonus values on private land are considered highly confidential and, therefore, are largely unavailable. Also, the mineral potential of the private lands would need to be evaluated so that the value by mineral potential could be properly assigned.

3. Adjusted High Potential Value: This method is somewhat similar to the one described above, except only a value for an area of high oil and gas potential with minimal access restrictions would be needed. This value would then be adjusted by prescription, using a percentage derived through a weighted matrix which considers the acres of various potentials by management unit and accessibility to those acres (see example). The single value needed is derived by determining the average value per acres from BLM competitive lease sales in the general area; northwest Wyoming (see exhibit A). The total lease rental fee is then added to that value. Since all BLM competitive lease sales are within or adjacent to Known Geologic Structures the mineral potential can be assumed to be high.

The methology described in item 3 is recommended because the values needed can be obtained relatively easily compared to the other methods. Also, the change in the value of an oil and gas lease, based on the acres of the various potentials and the restrictions imposed by the various prescriptions, can be easily shown. The values are also more defendable than those of the other methods.

Barry Burkhardt

BARRY BURKHARDT
Assistant Forest Geologist

EXHIBIT A

Competitive Lease Sale Results

Competitive Sale Date	Parcel #	Lease Acres	High Bid	$/Acre
11-30-83	18	80	$40,160.00	$502.00
11-30-83	19	321	16,050.00	50.00
11-30-83	20	40	966.40	24.16
11-30-83	21	53	2,866.86	54.09
11-30-83	22	196.5	2,460.00	12.52
11-30-83	23	375	4,910.00	13.09
11-30-83	25	18	2,870.00	159.44
2-1-84	4	240	18,132.00	75.55
2-1-84	5	80	36,160.00	452.00
2-1-84	20	120	24,120.00	201.00
			TOTAL	$1,543.85
			AVG.	$154.39/acre/decade

Value = Bonus Bid Value and Total rental fee/acre/decade
= $154 + $20
= $174/acre/decade
= $17.40/acre/year

The weighting of the various mineral potentials was derived by assigning the high potential a value of $174 as determined above. The low potential was assumed to have a value of $20 or equal to the total rental fee. By dividing the high value by the low value, it gives a ratio of about 9:1 and moderate was assumed to be slightly less than half of the high value and was given a weighting of 4.

Example

Management Unit #1 has 10,000 acres of which 5,000 acres involve high mineral potential and 5,000 acres involve moderate mineral potential. 1,000 acres of moderate potential is within wilderness, 1,000 acres are highly restricted to meet soil, water, and air minimum requirements, and 3,000 acres are only slightly restricted. 1,500 acres of the high potential are highly restricted and 3,500 acres only slightly restricted.

A. First the maximum index value is determined and assigned a value of 100%.

	High 9	Moderate 4	Low 1	None 0
Withdrawn (0)	0 X 0 (0)	0 X 1,000 (0)		
High (1)	9 X 1,500 (13,500)	4 X 1,000 (4,000)		
Moderate (2)	18 X 0 (0)	8 X 0 (0)		
Low (3)	27 X 3,500 (94,500)	12 X 3,000 (36,000)		

1. Total weighted acres = 148,000
2. Total weighted acres divided by Mgt. Unit acres = 14.8 = 100%

Prescription 1A: This Rx calls for 1,500 acres of the highly restricted high potential to become wilderness and 2,000 acres of both the high and moderate potential which is slightly restricted to now be managed for wildlife winter range which will involve a timing restriction on the oil and gas leases for that area.

	High	Moderate	Low	None
Withdrawn	0 X 1,500 (0)	0 X 1,000 (0)		
High	9 X 0 (0)	4 X 1,000 (4,000)		
Moderate	18 X 2,000 (36,000)	8 X 2,000 (16,000)		
Low	27 X 1,500 (40,500)	12 X 1,000 (12,000)		

1. Total weighted acres = 108,500
2. 108,500 ÷ 10,000 = 10.9
3. Rx index ÷ maximum index = 10.9 ÷ 14.8 = .73 = 73%

Therefore, the average value of a lease under this prescription would be $174 X 73% = $127/acre/decade.

CONOCO

E. Fred Birdsall
Public Lands Coordinator

Conoco Inc.
555 17th Street
Denver, CO 80202
(303) 291-6123

Sample of Response to Meeting
Between USFS and RMOGA

March 23, 1984

Mr. Tom Mitchell
USFS
Shoshone National Forest
225 West Yellowstone Avenue
Box 2140
Cody Wyoming,82414

Dear Tom:

Not only did I think our 3/21 meeting with you and Barry went very well, but also I was particularly impressed by your rising "above and beyond the call" in providing the typed notes and by whispering for several hours; it must have been extremely uncomfortable. I appreciated your direct, informed way of dealing with our concerns and objections. We still have some things to thresh out, but if that meeting is a predictor of how our future meetings are going to go then I feel optimistic that we should achieve quick and meaningful agreements.

Yours very truly,

Fred Birdsall

E. Fred Birdsall

jil
cc:
Steve Mealey ✓

Casper Division
Production United States

Marathon Oil Company

P.O. Box 120
Casper, Wyoming 82602
Telephone 307/235-2511

February 19, 1985

Sample of Response to Meetings
Between USFS and RMOGA

Clay

Mr. Stephen P. Mealey
Forest Supervisor
Shoshone National Forest
Post Office Box 2140
Cody, Wyoming 82414

Dear Steve;

RE: FOREST PLAN

I would like to thank you and your staff for the informative meeting we had on the proposed Forest Plan.

The strides which the Shoshone are attempting to make in regard to minerals coverage, especially oil and gas, are highly commendable. This innovative and practical approach to incorporating oil and gas in the plan has been absent from other plans in Region II. The use of an appendix which outlines the RMOGA matrix system and the way your planners incorporated the system, allow reviewers to determine how minerals as a resource compare, on a benchmark analysis, with other resources.

Appendix J is an additional benefit to all users of the National Forest. This appendix outlines the management prescriptions or direction for all the individual areas of the Forest.

In dealing with resources, specifically oil and gas, the way this proposed plan has there should be no misconceptions on the part of the general public as to how minerals will be handled in the Forest.

Sincerely,

Brad

Bradley G. Penn
Landman

BGP:dg

cc: Mr. Charles H. Hendricks
U. S. Forest Service

Sample of Response to Meetings
Between USFS and RMOGA

AtlanticRichfieldCompany
Public Affairs
555 Seventeenth Street
Denver, Colorado 80202
Telephone 303 293 7578

C.M. Moseley
Representative
Rocky Mountain Region

February 22, 1985

Steve Mealey
Forest Supervisor
Shoshone National Forest
225 West Yellowstone Avenue
Box 2140
Cody, Wyoming 82414

MINERALS

Re: **Shoshone National Forest - Planning Meeting**

Dear Steve:

The time you and your staff set aside to meet with Brad Penn and me was sincerely appreciated. Such meetings are important if industry and the Forest Service are ever going to come to some sort of agreement as to how energy and mineral resources should be incorporated into the planning process. This is especially important due to the proposed land exchange between BLM and the Forest Service where the Forest Service will become responsible for administering minerals on its lands.

There are a few thoughts I would like to share with you regarding our discussion of the upcoming forest plan. First, I support the effort that the Shoshone is putting forth in trying to come up with a system which integrates energy resources into the planning process. I would, however, like to reserve judgement on the methodology of assigning a dollar figure to lease acreage until we have a chance to review it in the draft documents. There may be concern within industry that for the Forest Service to assign an arbitrary dollar amount to lease acreage. misunderstandings may arise as to the actual worth of an idividual's lease. This approach is quite a departure from the way other land management offices have chosen to include energy resources in the planning process and it requires serious consideration both on the part of industry and government.

Your plans to include Appendix D in the DEIS, which describes your methodology and the RMOGA Matrix system is, I believe, essential. The additional Appendices J and K in the Draft Plan will provide site-specific information as to how the analysis areas are to be managed under the plan. By cross referencing these appendices, it will enable members of industry to determine how their areas of interest will be affected by the proposed plan. Therefore, their inclusion in the draft planning documents is also essential.

The fact that there are no plans to include a mineral potential map is of great concern to me. I believe that only with such a map will the public be able to adequately evaluate the proposed plan. If the map is made available with the proposed plan and DEIS, the public will be able to compare the areas of significant potential with the management prescriptions the Forest Service has chosen for these areas. It will facilitate public evaluation of the plan if it can be demonstrated where and for what reasons the Forest Service has made tradeoff decisions. Therefore, I encourage you to reconsider your decision and include the mineral potential map with the draft planning documents.

With regard to the Grizzly Bear Management Area No. 1, the decision not to lease the area is also of concern. This area is considered by the Forest Service to have low potential for oil and gas. Therefore, it would seem that there is no real need to place this area off limits to leasing. A No Surface Occupancy stipulation on a lease should be sufficient to protect the resource. Additionally, a statement should be included that conditions change in Grizzly Bear Management Area No. 1, the severe restrictions placed on oil and gas operations would be reconsidered and perhaps lifted if industry could prove that it could operate in a sound manner. It is possible that only mitigation measures are needed.

We are encouraged by your statement that oil and gas activities are wanted and needed on the Forest. The site-specific approach that you and your staff have taken in the planning process has considerable merit. This decision will provide the needed streamlining when new oil and gas activities are proposed on the Forest. The delays that have taken place on new proposals to date should be avoided or at least greatly minimized with this approach.

In conclusion, Brad Penn and I appreciated the time you and your staff took with us to explain your plan. We look forward to reviewing your draft plan in detail when it is available for public review. In fact, we will probably want to have another meeting to go over the plan and the methodology you used to reach your management decisions. Please feel free to contact me if you would like to discuss any questions.

Sincerely,

Claire

C. M. Moseley

cc: Mr. Charles H. Hendricks
Rocky Mountain Regional Office
Mr. Tom Mitchell
Shoshone National Forest Planner

Analysis Process Proposed
by RMOGA

CONSIDERATION OF ENERGY AND MINERAL RESOURCES IN THE BLM AND FOREST SERVICE PLANNING PROCESSES

Summary:

The oil and gas industry is affected by decisions made by the BLM and Forest Service in their land management planning. Because energy and mineral resources have not generally been considered on a par with other resources in the planning process, the RMOGA BLM/FS Subcommittee has developed a system to insure that energy and minerals are not subordinated in the planning process, but are considered in a way similar to other resources.

The RMOGA system depends heavily on the assessment of geologic favorability within a planning unit. While a number of methods exist to arrive at an assessment of geologic favorability, use of the RMOGA Mineral Rating System is encouraged because of its simplicity, its relatively uniform acceptance in the industry, and its inclusion of only those factors relevant to geologic favorability, excluding factors relevant to commercial development.

Access into planning unit areas is controlled by both discretionary and statutory restrictions varying from "unrestricted" to "withdrawal". Varying degrees of access restriction are considered in the planning process in the various proposed alternatives.

RMOGA proposes to measure the impact of a tentative planning decision and contrast that impact with other decisions by combining the two quantified criteria of geologic favorability and access restriction into a weighted matrix. The solution of the matrix identifies an index number quantifying the likelihood of development for a given degree of access restriction. Comparison of indices between alternatives becomes an effective measure of the relative quality of the alternatives insofar as oil and gas are concerned.

For illustrative purposes the matrix further identifies the limits of the decision zone within which access decisions may be made, and provides opportunity to express the quality of an alternative in terms of the percent point of the decision zone where the alternative lies. The methodology, being similar to that used for other planning unit resources, produces common denominator comparative data for conflict analysis and resolution.

While the final percentage arrived at for oil and gas development favorability for a particular alternative does have some meaning on its own, it is most meaningful when the process is examined to determine whether the percentage is higher (or lower) than another because of the given geologic favorability or because the access difficulty is lower (or higher) and whether the variation in access difficulty is statutory or discretionary.

R.M.O.G.A.
April 1983

INCLUDING MINERALS IN THE PLANNING PROCESS

Summary:

To insure that energy/minerals are not subordinated in the planning process, a method is proposed to define minerals in terms of the favorability of their occurrence versus the statutory or discretionary access restrictions which inhibit their exploration and development. The methodology, being similar to that used for other planning unit resources, produces common denominator comparative data for conflict analysis and resolution. The system is dependent on the quality of the mineral favorability ratings employed, and the use of RMOGA's mineral rating system is stressed.

R.M.O.G.A.
April 1983

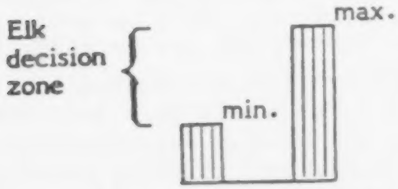
Introduction

Oil and gas operators are concerned when Forest Service and BLM land plans inadequately consider minerals. Too often it seems that surface resource allocations predominate, leaving the subsurface subordinated or ignored. This paper describes a process through which minerals could be included in the planning process in a fashion similar to that given other resources. It is offered in the spirit of constructive comment, towards working together.

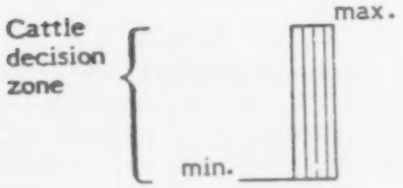
The Planning Process

We will initially describe the planning process as we see its application to decision making and conflict resolution for resources in general. We will later consider the treatment of minerals in an identical process.

The first element of the planning process, Issue Identification, results in the development of planning criteria and the collection of inventory data to quantify existing resource use and potential resource use in the planning unit. These quantified data for each individual resource are viewed through a benchmark analysis process in terms of minimum and maximum productivities, identifying in effect a decision zone for that resource. Minimum productivities are those legally required, and maximum productivities are those which could result were the whole planning unit dedicated to production of that resource or commodity; the land planner's decision zone is the difference between maximum and minimum productivities. When two or more resources compete for the same acreage, agency decisions are made, within the permitted decision zone window, allocating part of the planning unit to one commodity and part to another. These allocations are made under the conflict resolution process. Conflict resolution can assign concurrent areal allocations, sequential allocations, coexistent allocations, or mixes of these.



Choosing an illustrative example, elk versus livestock, minimum elk productivity is established in terms of maintaining minimum viable herd. Maximum elk result when all forage is allocated to elk.



Minimum livestock grazing is zero since there is no legal commitment to provide private grazing. Maximum livestock results when all forage is allocated to cattle. Benchmarks are thusly established for these two products, yet there is obvious conflict since the total forage is fixed. The land planner in consultation with both grazer and Fish & Wildlife agrees on some arbitrary mix of cattle and elk through the conflict resolution process.

The decision resulting from the conflict resolution process is quantifiable. In the above case it is number of AUMs allowed versus the number of elk allowed. Whether or not it is a "good" decision is subjectively interpreted. In practice several alternatives are considered with various mixes of cattle and elk. The agency identifies their preferred mix (preferred alternative) but requests public response on the "goodness" of the decision.

Obviously elk and cattle do not exist in planning vacuum. Consider timber harvest. More cut timber results in an immediate loss of cover for elk but a future forage production for both elk and cattle. This third unit commodity, timber, affecting the two forage-dependent commodities, gives another dimension to the allocation problem. Each other commodity . . . organized or primitive recreation, watershed, etc. . . . inserts its dimension as well to the problem and the various configurations and permutations are generally examined by the agency through what is called a matrix analysis. That analysis is a mathematical procedure which is independent of the number of dimensions of the problem; it can sort out the various interdependencies of the constituent elements and generate an array of tentative solutions (alternatives) which have measured the reactive effect of one resource commitment upon the chain of other resources which that resource influences.

We now turn to the question of the treating of minerals in similar fashion.

The Decision Window

In the preceding, the dimensions of the decision window are expressed within the limits of minimum statutorily required versus the maximum that would occur were it permitted. The degree of permissivity (or restriction) decides to what extent the resource could flourish. Number of board feet cut, number of AUM's granted, quantity of forage reserved for elk, are all measures of the permissivity accorded each particular resource. By the same measure, oil and gas operations are influenced by the degree of permissivity accorded. The influence is measurable in terms of the acres of each category of restriction. Land planning discourages or encourages oil activity through controlling access to resolve conflicts when two or more resources compete for the same surface acreage. That control is expressed through stipulations or withdrawals. (This is, after all, the only reason for stipulations.) These range from total withdrawal from leasing, through No Surface Occupancy lease stipulations, special lease restrictions, down to the most permissive case, standard stipulations. Statutory withdrawals establish the base case. The mix of acres in each category of restriction will change according to the alternative being considered.

We establish the first central thesis of this paper, namely that subsurface resources become available according to the degree of access permitted for their exploration and development. Access restrictions define the configuration of the decision zone window and differ from one alternative to another.

Habitat Potential

In any planning unit commodity, the agency takes into account the potential for production of that commodity. Elk or AUM production demand desirable forage. Timber cutting demands desirable tree stands. Each commodity or activity requires its desirable or essential habitat to exist. The planning process considers the extent to which the planning unit contains viable habitat for the resource in question, and the agency manages that habitat to produce whatever level of production is ultimately prescribed.

In similar fashion, habitat for oil and gas is definable. The requisite habitat of oil and gas is the product of geologic factors productive to or destructive of the generation and accumulation of hydrocarbons. Where requisite habitat elements occur, oil and gas exists. Where the requisite elements are absent, oil and gas do not exist. Geologists are professionals in dealing with the favorability or non-favorability of the petroleum habitat, and express their individual opinions of habitat into statistical terms of favorability or geologic potential. Those decisions when positive and distilled into a site-specific location result in the establishment of a "prospect." Up to this point, economics plays no part. Subsequent decisions on whether or not the prospect is "drillable" depend on highly confidential probable reserves estimates, drilling costs, the anticipated price of crude, whether or not the operator owns the lease, or if the acreage is open or owned by a competitor, how much perimeter protection acreage is necessary, owned, or available, etc. . . . all the data affecting the risk decisions the operator must make before acquisition and drilling.

Since favorability or geologic potential ratings are probabilistic--i.e. they never predict an absolute success but only the odds for success--the operator makes his drilling decisions on a probabilistic basis. Viz., if the odds are one in eight, then theoretically seven dry holes will accompany one commercial success. It is quite impossible to assign reserves estimates to one prospect or even to one planning unit, whether one is agency or operator. It's like assigning forest fires; the habitat of fire is known and fires can be predicted on a probabilistic or statistical basis for a broad area, but not for one planning unit.

We establish the second central thesis of this paper, that it is both unnecessary and statistically incorrect for the surface managing agency to identify quantitatively recoverable reserve estimates associated with one planning unit. It is both possible and sufficient to identify the potential for those resources in terms of geologic favorability.

Geology being a non-exact science, the assessments of geologic potential will often vary between geologists. An aggregate opinion when assessments agree will be more dependable than one sole opinion. Assessments will sometimes disagree because one geologist has a unique theory or perhaps proprietary data not available to others. The broader the participation in assessment of geologic potential, in general, the more dependable the result.

The combination of the two factors, access restriction and geologic favorability, results in a composite index reflecting the likelihood of development. More simply put, high geologic potential lands with low access restrictions will be developed. Low geologic potential will not be, and neither will highly restricted access lands. We will pursue the mathematical, quantitative development of this argument through the matrix concept of the following chapter.

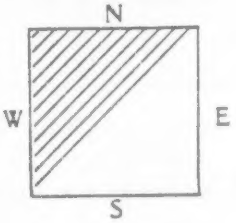
Matrix Analysis

The problem to be solved consists of identifying a means of combining the effect of surface access restrictions, which vary according to the planning alternative, with the subsurface geologic potential, which is fixed for a given area, then comparing the product of this combination between alternatives.

Suppose we are given a planning unit of 10,000 acres, called planning unit Alpha.

The northwestern half of Alpha is high geologic potential; the southeastern half is low potential.

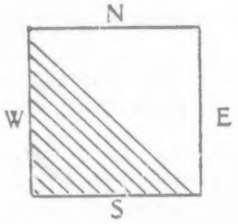
High potential	▨	5,000 acres
Low potential	□	5,000 acres



We now wish to compare the effects of two different alternatives on access to explore Alpha for oil and gas.

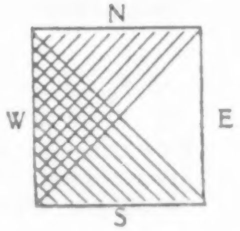
Alternative A of the land plan places high surface access restrictions on the southwest half, low restrictions on the northeast half.

High access restriction	▧	5,000 acres
Low access restriction	□	5,000 acres



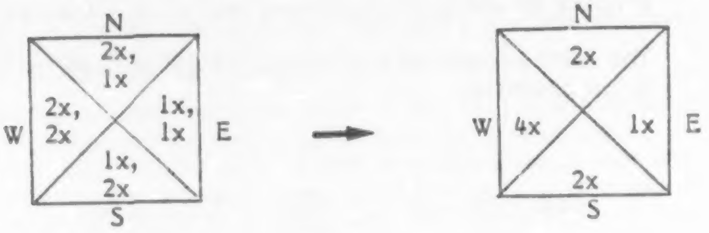
Overlying these two maps, we observe:

High potential, high restriction	▩	2,500 acres
Low potential, high restriction	▧	2,500 acres
High potential, low restriction	▨	2,500 acres
Low potential, low restriction	□	2,500 acres



We now assign a weighting system, with the premise that subsurface opportunity is least problematic and most promising in areas of high potential and low access restriction. The weights will be arbitrary, that high potential is twice as important (2x) as low potential (1x) and low access restriction is twice as favorable (2x) as high access restriction (1x).

Weighting Multipliers:



(components) → (product)

These weights are now multiplied times their affected acreages, i.e.

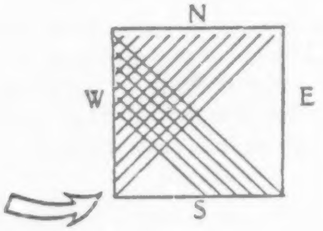
Northern quadrant:	2 x 2,500 acres	=	5,000
Western quadrant:	4 x 2,500 acres	=	10,000
Southern quadrant:	2 x 2,500 acres	=	5,000
Eastern quadrant:	1 x 2,500 acres	=	2,500

These products are added (total = 22,500) and then divided by the total planning area size (10,000), giving a dividend of 2.25. This number, 2.25, can be interpreted as a favorability index, or opportunity index, which can be associated with Alpha's particular configuration of access restriction under Alternative A.

The process is convenient to illustration through a matrix, plotting access restriction versus geologic potential as shown:

		Geologic Potential	
		High (2x)	Low (1x)
Access Restrictions	High (1x)	2 x _______ acres	1 x _______ acres
	Low (2x)	4 x _______ acres	2 x _______ acres

Now consider Alternative B, in which 1,000 acres in the southwestern corner are given easier access restrictions. The geologic potential, of course, remains unchanged and the map overlay shows:



Access restrictions
eased on 1,000 acres

This change adds 500 acres to high potential, low restriction quadrant, 500 acres to the low potential, low restriction quadrant, and subtracts 500 acres from each of the high restriction quadrants. The matrix now becomes

		Geologic Potential	
		High (2x)	Low (1x)
Access Restrictions	High (1x)	2 x 2,000 acres = 4,000	1 x 2,000 acres = 2,000
	Low (2x)	4 x 3,000 acres = 12,000	2 x 3,000 acres = 6,000

Adding the products we get 24,000 and dividing by the unit acreage of 10,000 we achieve a new index number of 2.4. This new index number, associated with the second alternative (B), is compared to the 2.25 index number from the first alternative (A). The greater magnitude of the second index, 2.4, is a measure of the degree to which the easing of access restrictions has enhanced exploration opportunity in Alpha.

* * *

The foregoing is a relatively simple matrix. It will serve the analysis better to have broadened ranges of both geologic potential and access restrictions. For example, minerals are typically rated on a 4-point scale ranging through Low, Low Intermediate, High Intermediate, and High. Oftentimes minerals potential for certain areas is rated Unknown, but such unknown areas are not included in this analysis. Some mineral rating systems employ a composite rating for each category consisting of both favorability and certainty. Any rating system is suitable, but RMOGA* prefers the relative simplicity of the following terms and their associated weights:

Low (x 1)	Very few geologic characteristics favorable for oil and gas accumulation are known to be present.
Low Intermediate (x2)	Some geologic characteristics favorable for oil and gas accumulation are present.
High Intermediate (x3)	A number of geologic characteristics are present to suggest the occurrence of oil and gas.
High (x4)	Many geologic features are present to indicate the probable occurrence of oil and gas.
Unknown	Few or no facts exist to justify ratings; true rating may be 1, 2, 3, or 4.

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*Appendix A contains a full description of the RMOGA minerals rating system.

The scale for access restrictions can be tailored to the particularities of the planning unit, and each level of restriction will contain a composite of both legal and discretionary restriction. The following factors and associated weights offer relative simplicity.

Totally Restricted (x 1)	Buildings, trails, things which cannot be moved. Some ACECs. Statutory or discretionary withdrawals. No leasing permitted.
Highly Restricted (x 2)	Prohibitively steep slopes. Buildings or trails which theoretically could be moved. Extremely fragile environmental resources. T&E species, W&S Rivers. Some ACECs. Leases usually contain NSO stips.
Moderately Restricted (x 3)	Hunting areas, seasonal mud, lambing or calving, strutting grounds, summer or winter wildlife forage. Alternatively, short-term impacts permitted if rehabilitated. Some ACECs. Leases usually show seasonal stipulations, road-building controls, etc.
Low Restrictions (x 4)	Access unrestricted by any surface resource. Reasonable surface damage, standard field practice permitted.

Using these scales in a 4x4 matrix would generate the following weights and products. (Nomenclature will be consistent that **weights** are the scales on the sides (x1, x2, x3, x4) and **matrix products** are the numbers inside the grid.)

		Geologic Potential			
		(High) x4	x3	x2	(Low) x1
Access Restrictions	(High) x1	4	3	2	1
	x2	8	6	4	2
	x3	12	9	6	3
	(Low) x4	16	12	8	4

Two features of the matrix will be explored--one, its increased sensitivity to restrictions in areas of high geologic potential as compared to areas of low potential, and second, the dimensions of the decision zone.

Consider the two cases, Case A when the geologic potential of the unit is high throughout and Case B where the geologic potential is low throughout.

Case A (High geologic potential)

The maximum matrix product is 16; i.e., if low restrictions applied throughout, the acreage would be multiplied by 16 to get the "opportunity index." The minimum matrix product is 4; i.e., when total restrictions apply, the acreage is multiplied by 4. These limits of 4 and 16 are benchmarks; their difference (16-4) is 12. This difference, 12, is the range size of the unrestrained decision zone. It defines the maximum range of exploratory opportunity applicable to the unit acreage.

Consider two alternatives for Case A; Alternative A-1 will be Highly Restricted (x2) with its associated matrix weight of 8. The difference between that matrix weight and the minimum weight of 4 is 4; the latter gives the relative position of the matrix weight in the decision zone. It is 4 units out of a possible 12; 4/12 = .333. This number, .333, can be interpreted as the degree to which the mineral opportunity index is restrained by access restrictions. Unrestrained access would have been 12/12 or 100% permissivity. In this case, restrictions have diminished the opportunity index to 33.3% of its unrestrained possibility. Preferred expression is 33.3% of Range.

Consider now Alternative A-2 for Case A. Let's say its matrix product turned out to be 10--somewhat more permissive than Alternative A-1. The total range of the decision zone is still 12, but the difference between the new matrix product of 10 and the minimum of 4 gives a relative position of 6 units out of the possible 12; 6/12 = .500, or 50% of Range.

Case B (Low geologic potential)

We now consider Case B, a neighboring planning unit contiguous to Case A which is of the same size as Case A but of low geologic potential throughout. (See diagram next page.) The right hand column of the matrix on the previous page shows the maximum matrix product is 4 and the minimum 1. Since we are uniquely in this column by virtue of low geologic potential, the matrix maximum and minimum are also benchmarks for Case B. The range or decision zone is 4-1 = 3.

Assume Case B's Alternative B-1 has maximum restriction throughout. The matrix product is thus 1. The difference between that and the minimum (1) is zero. The relative position is zero out of a possible 3; 0/3 = 0.0, or 0% of Range.

Consider a second alternative B-2 for Case B, Highly Restricted (x2) with a matrix product of 2, more permissive than Alternative B-1. The decision zone range is still 3, but the difference between the new matrix product of 2 and the minimum of 1 gives a relative position of 1 unit out of the possible 3; 1/3 = 33% of Range.

In summary:

CASE A: Range = 12

Alternative A-1
Max = 16
Min = 4
Actual = 8
Diff. (Actual-Min) = 4
% of Range = 33.3% (4/12)

Alternative A-2

Max = 16
Min = 4
Actual = 10
Diff. (Actual-Min) = 6
% of Range = 50.0% (6/12)

CASE B: Range = 3

Alternative B-1

Max = 4
Min = 1
Actual = 1
Diff. (Actual-Min) = 0
% of Range = 0% (0/3)

Alternative B-2

Max = 4
Min = 1
Actual = 2
Diff. (Actual-Min) = 1
% of Range = 33.3% (1/3)

We now consider the total planning area consisting of Case A plus Case B. For Alternative 1 we achieve the composite as follows:

$$\frac{\text{A-1 Diff.} + \text{B-1 Diff.}}{\text{A-1 Range} + \text{B-1 Range}} \times 100 = \text{\% of Range}$$

$$\frac{4 + 0}{12 + 3} = \frac{4}{15}$$

$$4/15 \times 100 = 26.7\%$$

Similarly for Alternative 2 we have

$$\frac{6 + 1}{12 + 3} = \frac{7}{15}$$

$$7/15 \times 100 = 46.7\%$$

Alternative 1	Case A 33%	Case B 0%	Case A + B 26.7%
	separate		composite

Alternative 2	Case A 50%	Case B 33%	Case A + B 46.7%
	separate		composite

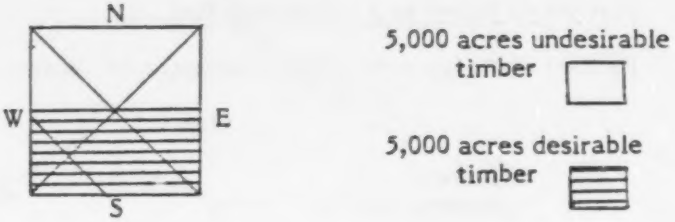
The results quantify that Alternative 2 of the combined planning units is 20% (46.7-26.7) less restrained than Alternative 1 by eased access restrictions. The opportunity index (likelihood of development) has been enhanced by that amount.

Note that in each alternative the composite % of range is more strongly influenced by Case A (High geologic potential) than by Case B (Low geologic potential). This illustrates the dominant influence of planning decisions in areas of high geologic potential as compared to decisions made in low potential areas.

Matrix Analysis of Non-Mineral Surface Resource

A common denominator for various forest commodities exists in the access criterion. It should be possible from that to derive extended relationships into any other variable to which those access restrictions apply. We will test this assumption through the example of timber harvest.

Returning to the 10,000 acre planning unit Alpha, let us assume that the southern half was desirable timber, the northern half undesirable.



			Timber Desirability	
			High (2x)	Low (1x)
Alternative A	Access Restrictions	High (1x)	2 x 3,750 = 7,500	1 x 1,250 = 1,250
		Low (2x)	4 x 1,250 = 5,000	2 x 3,750 = 7,500

The cross-product totals are 21,250, divided by Alpha's unit area of 10,000 gives 2.125.

Alternative B, which added 1,000 acres of low access difficulty in the southwest corner, changes the matrix:

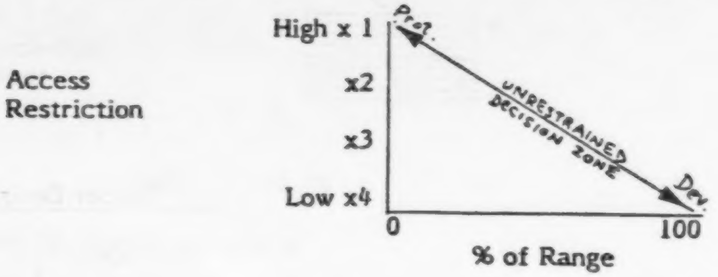
best copy available

			Timber Desirability	
			High (2x)	Low (1x)
Alternative A	Access Restrictions	High (1x)	2 x 2,750 = 5,500	1 x 1,250 = 1,250
		Low (2x)	4 x 2,250 = 9,000	2 x 3,750 = 7,500

The index for this alternative is 2.325, reflecting an increase of timber-cutting opportunity under Alternative B in the "desirable timber" area. Were we to compute a percent of range calculation on timber, just as we did in minerals, we would discover Alternative A used 37.5% of range and Alternative B used 44.2% of range.

Percent of Range as a Diagnostic Tool

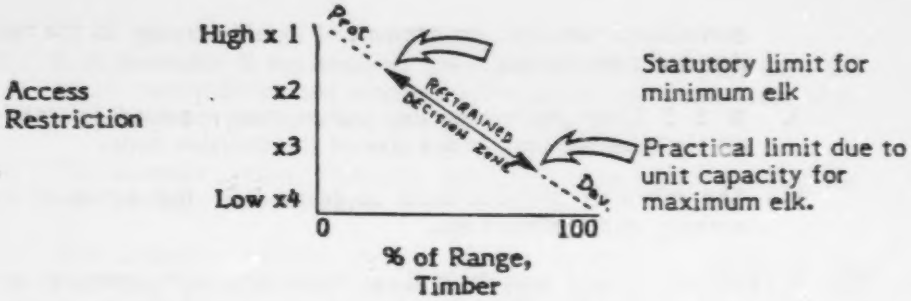
Percent of Range versus Alternative can be illustrated on this generic chart:



Total permissivity (Access Restriction Category x4) correlates with 100% of range, and total withdrawal (A.R. Category x1) with 0% of range. The decision path is the diagonal vector, up and left towards protectionism, down and right towards pro-development.

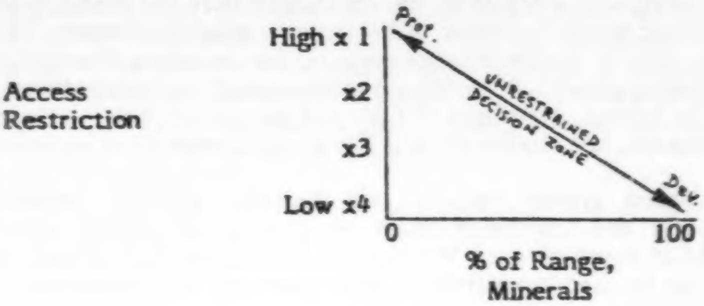
As we have earlier indicated, there are limits on the length of the decision zone vector, both statutory and practical, and may restrain either the development or the protective end.

Consider for example elk, and assume that elk require a 2:1 forage to cover ratio for summertime grazing. Since unit Alpha only has 5,000 acres of forage (in the "undesirable timber" part), only 2,500 acres of "desirable timber" are needed to support the 2:1 ratio. The maximum possible number of elk wouldn't require but half the desirable timber. This places some limitation point on the decision zone vector on the timber pro-development end, beyond which access decisions on elk are irrelevant. The statutory minimum elk herd similarly places some limit on the protectionism end of the vector. Graphically this is shown:

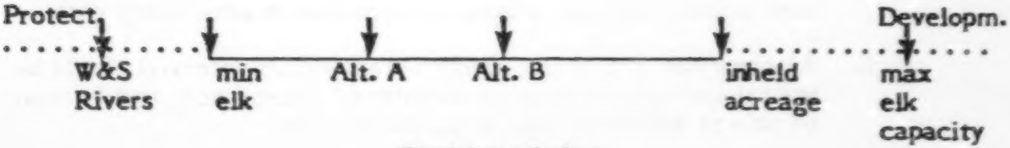


If we were to consider another resource, for example Wild and Scenic Rivers, it may or may not extend the upper left statutory limit into the Decision Zone, depending on the acres withdrawn and whether or not those acres include or exceed the habitat acres required for minimum elk. Similarly, existing developments, or private inholdings, might either lie within or conceivably extend the cutoff on the pro-development end of the decision vector.

We could now similarly plot Access Restrictions versus % of Range for Minerals and arrive at a diagnostic portrayal on the decision zone vector.



A very powerful interpretive advantage to this procedure may now be illustrated. Because the coordinates of this chart, Access Restriction and % of Range, are common we can reduce the diagonal vector to a simple line showing the various practical and statutorial limits, and put along this line the positions of each of the alternatives.



Decision window.

This line, or vector, can be interpreted as follows:

1. Alternative B is more permissive (more pro-development) than Alternative A.

2. The elk decision zone theoretically lies between minimum legally required and maximum carrying capacity. The maximum is

diminished, however, on account of inheld acreage so the real elk decision zone is less.

3. W & S River protection lies within that required for minimum elk, so does not impact the size of the decision zone.

4. The minerals decision zone is defined by the limits of inheld acreage and minimum elk.

This is obviously a very simplistic illustration of a very complex problem. It merely points out the possibilities of including minerals in the decision window process. Caution is clearly required that the final decision is not based solely on maximizing resource outputs based on opportunity indices or percents of range. The numbers are not decisive in themselves but serve rather as tools to promote balanced decisions or provide illustrative comparison as to why one resource was promoted over another. Nothing herein replaces good judgment.

Conclusion

By regarding the similarities in measuring potential resource outputs from a planning unit, one is drawn to the conclusion that the planning function is one of habitat management whether it be for elk, grazing, timber, T&E species, or oil and gas. Elk or cattle management is, for example, forage management, not animal management. Petroleum management is in fact habitat management via access restriction, the habitat of oil and gas simply being a function of geologic circumstances, not always obvious but always present.

The proposed system relates two factors, geologic potential and access restrictions, and combines those to give a composite index reflecting the likelihood of development. The factors are independent of each other. The same factors can be used in analysis of other planning unit resources.

A system to employ these factors in minerals analysis should meet the following tests. We believe this system does.

1. The agency should be capable of performing the study entirely by themselves. Mineral potential ratings can be drawn by internal agency capabilities, the USGS or Bureau of Mines, or outside contract. It is extremely useful to supplement internal ratings with industry opinion, without compromise of proprietary data.

2. Any analysis system examining access versus potential should be logical and simple to enjoy widespread acceptance, and it must be able to withstand legal or public scrutiny.

3. The analysis system should be consistent between planning units and between agencies.

4. The analysis system should permit meaningful comparisons between tentative planning alternatives and provide meaningful basis for conflict resolution.

5. It is desirable if the analysis system resembles analyses used for other commodities and employs terminology and activities with which agency planners are already accustomed.

6. The analysis system should be capable of simplified updating for new geologic information.

7. The analysis system should give predominant influence to planning decisions in areas of high geologic potential as compared to low.

8. The system should have an easily understood display capability for public documents.

9. The system should not override common sense and good judgment.

We believe our proposed system for consideration of minerals through the matrix process has one outstanding virtue. It compels the planner to consider the estimated distribution and potential of subsurface resources in his or her planning unit. That consideration is long overdue and essential to any later tradeoff decisions. The obvious weakness of the system is its inability to reckon with the mineral rating of **Unknown**. However, it is eminently preferable to work with a system which capitalizes on the strengths of known data, now, without undue delay from that which is unknown.

APPENDIX ONE

RMOGA - Endorsed Minerals Rating System

RMOGA has the capability of bringing to the attention of its members the need or opportunity to respond individually to the Forest Service or BLM when land plans are at public comment stages.

At the inventory collection step of the planning cycle, RMOGA believes it extremely useful for agencies to solicit industry opinion on geologic favorability ratings of each planning unit. RMOGA endorses the rating system described in this Appendix, which is similar to that proposed in the Federal Register 46FR 60562 (December 10, 1981).

When solicited by the agency, RMOGA provides its interested members an Assessment Form and Instructions (attached) plus the agency-supplied map of the planning unit. Those members rate minerals favorability on a numeric basis together with whatever reference or citations they may wish to provide and return the rating directly to the agency. The agency is then in a position to compare submitted ratings with each other or with the agency's own rating. Having the name and address of the company rater, the agency can when desired check out anomalous ratings directly with that company.

The ratings consider a variety of geologic characteristics, viz.:

1. Presence of marine sedimentary rocks.
2. Presence of hydrocarbon source rocks.
3. Presence of reservoir rocks with requisite porosity/ permeability.
4. Potential for structural/stratigraphic traps to exist.
5. Migration routes from source to trap.
6. Peripheral considerations such as temperature, depth of burial, sequence and timing of geologic deformations, etc.

The rating assigned to any planning unit is the highest that could exist in any sector of that unit.

(APPENDIX ONE)

INSTRUCTIONS

A. One of the attached assessments forms should be completed for each tract for which you have geologic information. There is one form for each tract, with a map showing the location of the tract on the back of the form.

B. A rating should be assigned to each of the mineral or energy resources listed on the form, based on the tract's favorability to contain that resource. "Favorability" is defined as follows:

> Favorability is the potential of a particular geologic environment to contain quantities of mineral and energy resources. Favorability does not consider the feasibility of extraction, the accessibility to the tract, or other factors that might preclude economic development of the resource. Favorability is a rating of the resource based on the (1) adverse, to (2) permissive, to (3) suggestive, to (4) highly suggestive nature of the geologic framework present within and adjacent to an area.

RATINGS*

1 = lowest measure of favorability: very few geologic characteristics favorable for the accumulation of a given resource are known to be present.

2 = low intermediate favorability: some geologic characteristics are present that are favorable for the accumulation of a given resource.

3 = high intermediate favorability: a number of geologic characteristics are present that suggest the occurrence of a given resource.

4 = highest favorability: many geologic features are present that indicate the occurrence of a given resource.

U = unknown favorability: this rating will be applied when there are few or no facts on which to make the evaluation, and the true rating may be 1,2,3, or 4.

*Leave blank those areas in which you have no interest.

C. If more specific location information is available, and you are willing to provide us with such information, feel free to identify such information on the tract map.

D. Remarks — indicate any clarifying information about the rating assigned (type of bed, stratification, depth, etc.)

E.- Commentary and Summary — any narrative description in support of your ratings should be included here. The more back-up information that is provided to support your rating, the more helpful these ratings will be to us in allocating resources and land uses when the inventory is complete.

F. Geology — include any geologic support data here (age, structures, belts, etc.)

G. Reference/Citation — if any public documents are available for reference in support of the information given, list them here.

H. Rated by — give the name and telephone number of the rater or the person to contact for clarification or follow-up on the data provided. Include a mailing address to insure that you receive information on the progress of the planning process and opportunities for additional public involvement.

ASSESSMENT FORM

ENERGY AND MINERAL RESOURCE EVALUATION

(APPENDIX ONE)

Bureau of Land Management

WSA: #UT-060-068A

Name: Desolation Canyon

AS OF (DATE): 3/1/83

STATE/COUNTY: Moab District, Utah

ENERGY OR MINERAL RESOURCE	RATING	REMARKS
OIL AND GAS	4	
URANIUM		
COAL	3 +	
GEOTHERMAL		
LOCATABLE MINERALS (Specify)		
LEASABLE MINERALS (Specify)		

SAMPLE

COMMENTARY AND SUMMARY:

Uncompahgre Uplift crosses the southern half of the WSA, providing structural and stratigraphic entrapments on crest and flanks.

GEOLOGY:

REFERENCE/CITATION:

Fred Birdsall
(303) 575-6123

Conoco, Inc.
555 17th St.
Denver CO 80222

RATED BY:
(NAME OF COMPANY, PERSON TO CONTACT, MAILING ADDRESS & PHONE NO.)

Handout Distributed at Meeting
Between the USFS and RMOGA

1920

INTEGRATING OIL AND GAS CONSIDERATIONS INTO FOREST PLANNING - THE SHOSHONE NATIONAL FOREST PLANNING PROCESS

PURPOSE -

The purpose of this paper is to present some of the basic features of the Planning process being used on the Shoshone National Forest and then discuss how Oil and Gas considerations are being incorporated into this process.

Background -

Like all other National Forests, the Shoshone National Forest is engaged in Forest Planning as required by the National Forest Management Act of 1976 (NFMA). The purposes of such planning are threefold:

1. Produce a detailed plan for management of the Forest over the next 10 years with an assesment of the environmental effects and actions that would logically follow for 40 years beyond that.
2. Develop a planning process capable of providing analysis and information for decision making quickly to respond to emerging issues and concerns.
3. Develop an integrated database capable of supporting the data needs of analysis as well as capable of being updated as needed.

These three purposes must be accomplished while meeting requirements of all laws and regulations governing management of National Forests. Further, planning is done with the objective of maximizing net public benefits (NPB) from management of the Forest.

Planning on the Shoshone -

As a basis for understanding how Oil and Gas considerations are integrated into Forest Planning on the Shoshone, there must be some understanding of the major components of the involved analysis. Specifically, the two building blocks in analysis, analysis areas and prescriptions for those areas.

On the Shoshone National Forest, an analysis area is a contiguous piece of ground that can be managed as a single unit. Often, the boundaries of these analysis areas coincide with range allotment boundaries. An analysis area may contain one or more RARE II areas or portions of RARE II areas, may contain tentatively suitable timber land, suitable range land, lakes, streams, roads, camp grounds, and have mineral resources underlying it.

Prescriptions are in essence management plans for analysis areas. In other words, given the particular characteristics of an analysis area, all possible ways of managing all resources within that area are represented as mini-plans just for that area. For example, a single prescription could be: build 2 miles of road, harvest some timber along the road, build a trailhead at the end of the road and some trail leading from the trailhead into the neighboring wilderness area, protect high quality riparian areas through the use of management fencing, develop 2 springs for watering of livestock, and graze all suitable rangeland leaving 50% of the forage for wildlife use.

A Forest Plan alternative, then, is a set of such prescriptions, one prescription for each analysis area. The selection of a prescription for an analysis area in an alternative is based on the relative merits including economic efficiency of that prescription analysis area combination compared with the merits of all other precription analysis area combinations. In this way, we attempt to create alternatives that achieve desired results in the most cost efficient manner possible.

Another feature of Forest Planning on the Shoshone N. F. is that we concentrate our efforts on construction and analysis of real prescriptions. If a prescription violates legal minimums, it can not be implemented. We spend little time analyzing such prescriptions for any time and effort spent on those type of prescriptions detracts from the amount of time, energy, and modeling power we could devote to higher quality analysis of real possibilities. This means that all prescriptions analyzed in detail on the Shoshone are legal, feasible, and can be implemented as modeled.

The lowest level of resolution for reporting analysis results is the analysis area. Management strategies for each analysis area, their costs and their benefits are designed and esitmated and are then entered directly into our analysis models. We have the capability, then, of reporting out results by analysis area as well as aggregating reports to any level of interest - e.g. by major drainage, Ranger District, multi-disticts, up to the entire Forest.

Integrating Oil and Gas considerations -

Oil and Gas operations are recognized as legitimate uses of a National Forest. They are included in the same manner all other uses are included. All recource uses are modeled in terms of some form of physical relationship or output (e.g. board feet of timber, animal unit months of grazing, acres of retention visual quality (a measure of how close to natural appearing the landscape is), acres of protected wildlife habitat, etc.) And all uses are modeled in terms of their economic value. For market outputs (e.g. timber and range), market transactions are used to identify economic value. For non-market outputs, "willingness to pay " values are calculated and used in the model.

Oil and Gas are no exception to this rule. In terms of physical outputs, we are modeling two kinds of outputs:

1. Acres of YYYY potential that are available for Oil and Gas operations with stipulations associated with ZZZZ hazard to soil and water resurces. Where YYYY can be low, moderate, high or none potential and ZZZZ is slight, moderate, or high hazard.

2. An index comparing the relative availability of these acres to development operations within a prescription to the maximum that could be allowed without violating law or regulation.

Beyond these two physical measures, a willingness to pay type of value is used for the economic value of Oil and Gas development within a prescription. Calculation of this value reflects Oil and Gas potentials within an analysis area and the restrictions asociated with specific prescriptions. This value is based on recorded market transactions for neighboring areas - thus it is close to a market value for a lease, but not quite.

Data used for this analysis:

1. For oil and gas potential - the potentials map prepared by U.S. Forest Service and U.S. Geological Survey ("Open File Report 81-667).

2. For soil and water hazard - soils, landform, topographic, and vegetative community information developed on Forest and using procedures outlined in the "Washakie Oil and Gas DEIS" to rate hazard as prescribed by Regional Policy.

3. For "willingness to pay values" we are using data from BLM competitive lease sales in the general area. (As stated, these are adjusted by prescriptions and by area depending on the potentials of the area, land suitability for surface occupancy, and restrictions within a prescription.)

Examples of Oil and Gas Calculation -

The calculation methods used parallel those proposed by RMOGA.

Assume a contiguous analysis area that contains a total of 10,000 acres equally split between high oil and gas potential and moderate potential.

Within the 5000 acres of high potential:

3500 acres have a slight hazard to soil and water

1500 acres have a severe hazard and would carry high restrictions on oil and gas operation.

Within the 5000 acres of moderate potential:

1000 acres are within wilderness and are thus unavailable
1000 acres are areas of severe soil and water hazard
3000 acres are areas of slight hazard.

Entries of acres in a low restriction prescription, then would be:
1500 acres of high potential with no surface occupancy
3500 acres of high potential with slight hazard
1000 acres of moderate potential with no surface occupancy
3000 acres of moderate potential with silght hazard.

Beyond this, there would be a calculation of an index value -

	High Potential (weignt 9)	Moderate Potential (4)	Low Potential (1)	none (0)
withdrawn (weight 0)	0 x 0 (0)	0 x 1000 (0)		
High Restriction (weight 1)	9 x 1500 (13500)	4 x 1000 (4000)		
Moderate Restriction (2)	18 x 0 (0)	8 x 0 (0)		
Low Restriction (3)	27 x 3500 (94500)	12 x 3000 (36000)		

Total weighted acres = 13500+ 4000 + 94500 + 36000 = 148,000
Total weighted acres/analysis area acres = 14.8

Thus a prescription with minimum restrictions on oil and gas would have an index value of 14.8 which would mean that 100% of the area in this unit that is capable of oil and gas development is available for such development.

Assume a second prescriptions calls for 1500 acres of the highly restricted high potential land to be recommended for wilderness and that 2000 acres of the slight hazard land of both the high and moderate potential are to be managed for wildlife winter range resulting in moderate restrictions on timing of development, then the calculations would be

	High (9)	Moderate (4)	Low (1)	None (0)
Withdrawn (0)	0 x 1500 (0)	0 x 1000 (0)		
High (1)	9 x 0 (0)	4 x 1000 (4000)		

Mod.	(2)	18 x 2000 (36000)	8 x 2000 (16000)
Low	(3)	27 x 1500 (40500)	12 x 1000 (12000)

Total weighted acres = 108,500
Weighted acres/acre of analysis area = 10.85
Prescrition index/maximum index = 10.85/14.8 = .73

Entries in the analysis model for these two prescriptions, then, would include a display of acres by oil and gas potential by the amount of restrictions/hazard placed on those acres as illustrated. Also there will be the percentage values, in these two cases it would be 100% and 73%. Beyond these, there will be a dollar value per acre of the allotment representing the lease value.

Calculations of this dollar value begin with a calculation of the lease value of an acre of high potential land. The lease value is the value paid by bidders in BLM competitive lease sales plus the lease fee. An initial calculation of this value from lease sales in Northwest Wyoming show a value of approximately $170. per acre per decade.

Index values are then used to provide an dollar value for this area by prescription. For example:

per acre value for prescription 1 = ($170)x (14.8/14.8) =
= $170./acre/decade

per acre value for prescription 2 = ($170) x (10.85/14.8) =
= $126./acre/decade

The above calculations are done and the total set of outputs are coded into our analysis model for every prescription for every analysis area including RARE II areas. In this way Oil and Gas development considerations are explicitly included in all phases of analysis and decision making.

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MINERAL POTENTIAL REPORT
FOR
SHOSHONE NATIONAL FOREST

BY

JOHN S. DERSCH, Geologist
USDA, Forest Service
Watershed, Soils, and Minerals
Area Management

June, 1982

Lakewood, Colorado

ANALYSIS OF THE PLANNING REQUIREMENTS

A. Introduction

The National Forest Management Act of 1976 requires that Land Management Plans be created for National Forest System lands. The regulations (36 CFR 219.12j) state:

". . . when available, the following will be recognized in the Forest Plan:

1. Active mines within the area of land covered by the Forest Plan;
2. Outstanding or reserved mineral rights;
3. The probable occurrence of various minerals, including locatable, leasable, and common variety;
4. The potential for future mineral development and potential for withdrawal from development, and;
5. The probable effects of renewable resource allocations and management on mineral resources and activities, including exploration and development."

The mineral resources assessment provides the information to document and display the foregoing in the Forest Plan, and relate it to management practices, standards, prescriptions, and alternatives.

B. Analysis

A mineral potential evaluation was conducted to determine the possible existence of locatable and leasable mineral deposits in the Forest and Grassland areas. Mineral potentials were determined for metallic and non-metallic minerals and energy fuels. A set of general criteria was established which included known favorable geology and structure, known mineral occurrences and reserves (if data available), and field activity related to mineral exploration, development, and production. The "potential levels," determined as high, medium, and low, are based on today's knowledge and prices and may change at any time, depending on the mineral economy, technological advances, or further exploration. High mineral potential includes favorable geology and structure, known economically valuable mineral occurrences and reserves (if data available), and field activity. Medium mineral potential includes favorable geology and structure, known mineral occurrences with insufficient evidence of present economic value, or sub-economic deposits, and occasional activity. Low potential includes geology considered unfavorable at this time, no known mineral occurrences, explored or prospected sites determined non-economic, and little or no present activity. The low potential level does not infer the lack of mineral deposits, but rather insufficient knowledge at this time. (See Page 4 for mineral potential level matrix.)

The following six mineral element levels "rate" the potential occurrence of mineral- related activities during the life of the management plan:

1. Locatable/leasable minerals - Producing sites/known reserves
2. Locatable minerals - High/medium potential
3. Leasable minerals - High/medium potential
4. Locatable/leasable minerals - Low potential
5. Reservations and Outstanding Rights - All have potential; Mineral Withdrawals
6. Salable minerals - Known areas

(See Pages 5 to 7 for a detailed description of the mineral element levels.)

The areas of known reserves and producing sites must be administered knowing that surface resource management programs will require close coordination with the mineral activity. Forest Administration will involve access, related special use permits, reclamation, and the like.

In high and medium potential areas, any stage of exploration, production, or development can be expected to occur during the first ten years of the plan's application.

With respect to low potential areas, the probabilities are that any mineral activities during the first ten years of the plan will be limited to prospecting and exploration. Even if a valuable deposit is discovered, particularly a major one, it is unlikely that the necessary permits and approvals can be acquired to put it into production within the ten year period.

Advances in exploration or production technology may result in greater activity levels in all areas, regardless of the current potential rating.

The Forest resource manager needs to consider what types of mineral activity are likely to occur and how this activity will affect surface resource programs. The search for minerals can be expected to start from an area with a "history of production" or "similar geologic environment" (relative to known deposits) and radiate from that point. The sequence of activities is usually prospecting, exploration, development, and production. Exploration methods include, but are not limited to, photogeology, geophysical and geochemical methods, surface drilling, and underground work. Those activities involving significant surface disturbance are normally covered by an operating plan or prospecting permit. Development and production may follow if a valuable deposit of minerals or fossil fuels is found. The methods of development for a minable mineral or fossil fuel deposit cannot be determined until knowledge of the ore body configuration, the grade and tonnage of ore, the depth of the mineralization, and other factors have been gained. Current technology requires that oil, gas, and geothermal resources be developed by wells with associated surface facilities. Approvals of operating plans for development and production are preceded by environmental analyses, or environmental impact statements if the proposed activities are considered to be major Federal actions affecting the environment.

Most patented mining claims will be found in levels classified 1, 2, and 3, above. Except in Wildernesses, patentees acquire both the surface and the minerals estates. Such properties are private land in every sense of the term. The Forest Service has no direct authority over operations on such lands.

The potential maps were developed by gathering data from individuals and references, plotting on overlays, and evaluating the data. Mineral expertise was sought from Federal, State, and private sectors. Some of the individuals contacted were:

Jack Antweiler - U.S. Geological Survey
Bob Berry - Exxon Minerals, Inc.
Carl Bieniewski - U.S. Bureau of Mines
Bill Bowes - Geologist, Steamboat Springs, Colorado
Jim Elliott - U.S. Geological Survey
Fred Fisher - U.S. Geological Survey
Gerry Gerrow - Exxon Minerals, Inc.
Dan Hausel - Wyoming Geological Survey
Dave Love - U.S. Geological Survey
Mike Owens - Homestake Mining Company
Doug Rankin - U.S. Geological Survey
Ora Rostad - Amax Exploration, Inc.
Frank Simons - U.S. Geological Survey
Chuck Spencer - U.S. Geological Survey
John Wells - Timberline Minerals, Inc.
Bill Wilson - Geologist, Centennial, Wyoming

The determination of mineral resource potentials is based on available data, interpretations, and professional judgement. The information on the accompanying maps is displayed in two levels, high-medium and low, for locatables and leasables, and known source areas for common varieties.

POTENTIAL MATRIX [1]

CRITERIA	HIGH	MEDIUM	LOW
Favorable geology and structure	In several mining districts; areas of present day final exploration or development activities.		Lack of knowledge
Mineral occurrences and known reserve	Occurrence being developed or high prospect of success; blocked out reserves.	Extension of known reserves or occurrences deemed probable ore deposit.	Occurrence reviewed by mineral examination and consider non-economic or undiscovered reserves.
Field activities	Producing mine activity leading to development.	Seismic drilling, coring, trenching.	Claims, leases, sporadic assessment work.

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[1] All items in the matrix are of a general nature and are intended to give a basic idea of what might take place on the ground.

(J. S. Dersch, November 1979)

MINERAL LEVEL 1

Areas in this Level contain known mineral reserves or producing sites.

These areas are currently, or probably will be, experiencing development and production of mineral reserves. Mineral-related activities will take place during the lifetime of the plan. Exploration will search for additional reserves adjacent to, or further delineate, a known mineral deposit. Current production continues during the lifetime of the plan, depending on the mineral economy and the amount of ore remaining. Current levels of activities in these areas can be expected to remain constant or even increase. The development of private land and minerals within the Forest boundary may affect adjacent Forest land and the objectives for planned surface resource management. Applicable National Forest System surface resources are dependent upon the mineral type and estate.

Forest Action. Only surface management programs that are compatible with the mineral activities should be considered in these areas. Access to the producing sites will exist, but access and special use permits to the extended reserve areas may be needed during the first ten years of the plan.

MINERAL LEVEL 2

Areas in this Level contain high to medium potential for valuable deposits of minerals locatable under the General Mining Laws. The method of developing mineral deposits remains uncertain until sufficient knowledge of the mineralization is obtained.

Activities in this Level on unpatented mining claims will include exploration, such as surface sampling, trenching, and drilling which, if significant surface disturbance results, must be covered by an operating plan. Development and production may follow if an economical ore body is delineated. The potential for mineral activities is high.

Forest Actions and Controls. Capital investments, particularly existing recreational facilities, could be jeopardized by mining operations. Mineral-related activities will usually have minimal effect on programmed goals and objectives for other resources, including timber, range, wildlife, and water. Methods of exercising the right of ingress and egress given to the miner by law shall be consistent with what is needed and with necessary surface resource protection measures. Applicable Federal and State environmental statues will be observed. Rehabilitation should be consistent with the goals and objectives for the areas as described in the plan. Regulation of activities on mining claims, if patented and thereby no longer in Federal ownership, is under the sole jurisdiction of the State. Also to be considered are the effects of activities that take place on private lands which are adjacent to National Forest System lands.

MINERAL LEVEL 3

Areas in this Level contain high to medium potential for leasable minerals. Extraction is authorized by a lease issued by the Department of the Interior, subject to Forest Service recommendations or consent, as may be applicable, and to Forest Service stipulatory requirements for surface resource protection and reclamation. Development methods for oil, gas, and geothermal resources will be by well facilities, with associated surface equipment and installations. Development methods for other types of minerals remain uncertain pending sufficient knowledge of the deposits.

Activities in this Level will be exploration, including but not limited to photogeologic mapping, seismic and resistivity work, and drilling, covered by a lease or a prospecting permit (the latter may be issued by the FS or BLM, depending on the situation).

The granting of a prospecting permit by the Forest Service does not grant any rights to or for development of a deposit should one be found. The Department of the Interior may grant a "preference rights lease" for some minerals except coal and geothermal resources. Development and production will follow if an economical mineral deposit is delineated. The potential for the occurrence of mineral-related activities is high.

Forest Actions and Controls. Capital investment, particularly developed recreational facilities, could be jeopardized as the result of mineral-related activities in and adjacent to these areas. Mineral-related activities will have minimal effects on programmed goals and objectives for other resources, including range and wildlife. The means of access shall be consistent with the leaseholder's needs and measures necessary for protection of surface resources. Applicable Federal and State environmental statutes will apply where appropriate. Rehabilitation should be consistent with the goals and objectives for the area as described in the plan.

MINERAL LEVEL 4

Areas in this Level have low potential for valuable deposits of locatable and leasable minerals. The probability that mineral extraction will occur within the first ten years of the plan is low. Prospecting may or may not find valuable deposits. Even if it does, considerable time is still necessary to acquire the necessary authorizations and to prepare for production. Some areas are considered low in mineral potential, not because there is no mineralization, but because of the lack of knowledge about the area at this time. Exploratory activities may increase in these areas if commodity demands increase, if known reserves become depleted, if new information about the genesis and geologic environments of valuable deposits is disclosed, or if new advances in exploration technology occur.

Forest Actions and Controls. All surface resource programs, including capital investments, can be implemented because mineral-related activities can be expected to have minimal effect on them.

MINERAL LEVEL 5

This Level is concerned with the mineral estate status, specifically non-Federal ownership of the minerals or withdrawals from mineral entry. Areas in this Level contain high, medium, or low potential for valuable deposits of minerals that would be locatable or leasable if in Federal ownership. Included in these areas are mineral rights reserved or outstanding in third parties. Reservations are minerals retained when the surface was acquired by the Government. Outstanding rights are minerals that were retained by transactions prior to Federal acquisition of the surface. The minerals are private or state owned ("alien") while the surface is Federal and managed by the Forest Service. Some reservations may be subject to the Secretary's rules and regulations contained in the original deed. The rules and regulations provide for some surface resource management control. Some reserved minerals will change to acquired status during the life of the plan.

Activities within this Level involving reserved or outstanding minerals will be exploration, production, and development. The type of mineral sought will determine the specific action at each activity level. These actions could have a major impact on Forest surface resource management programs. The potential for mineral activities in this Level is uncertain.

All mineral withdrawals are included in this Level. Each withdrawal should be reviewed to determine whether or not it applies to the Mining Laws and/or the mineral leasing laws and to determine accurately the tracts of land involved. These tracts should be shown on a map overlay. The land manager should review this overlay when an operating plan is received since the proposed activity may be affected by a withdrawal.

Forest Actions and Controls. Capital investments, particularly developed recreation, could be jeopardized as the result of mining activity in and adjacent to areas of reservations or outstanding rights. The alienated rights and mineral values must be considered in surface resource allocation proposals.

MINERAL LEVEL 6

This Level contains materials known as "salable" or "common varieties." Inservice use of these materials would be for building and maintaining timber sale roads and forest system roads. Common variety materials may be disposed of through special use permits with appropriately determined fees. Common varieties may include clay, sand, gravel, and some types of decorative rock. Each permit will require stipulations for protection of the surface resources. The method of development for these resources will be dependent upon the location and nature of the deposit.

Forests Actions and Controls. The sale of minerals does not limit the right of the U.S. Government to use the surface of a sale area and to issue permits and licenses that do not interfere with the purchaser's production of minerals. The land must be reclaimed as required by applicable law and the sale contract when common variety production is completed.

MINERAL ACTIVITIES

The State of Wyoming produced $2.534 billion worth of metallic and nonmetallic minerals and energy fuels in 1980 (Goodier and Hoffman, 1981). Nonfuel mineral production in 1980 totaled $761 million (Starch, 1982). The five counties within the Forest accounted for 24% of the 1980 output with production of petroleum, natural gas, iron ore, uranium, sand and gravel, coal, and gypsum. The Annual Report of the State Mine Inspector (1981) indicates that U.S. Steel (Atlantic City) produced 1,698,426 tons of iron pellets and Celotex (Cody) produced 143,482 tons of gypsum wallboard.

Summary:

Throughout the Forest, and in particular the northern half, there are numerous metallic and nonmetallic mineral occurrences. Copper and molybdenum are found with silver, lead, and zinc at Kirwin, Stinkingwater, Eagle Creek, and Sunlight. Drilling has been conducted by several firms exploring these areas during the past few years. Replacement deposits of silver-lead-zinc have been mined in the Republic Mountain area. Iron reserves and gold are found at Atlantic City. Some of the other commodities found include uranium, asbestos, thorium, zeolites, gypsum, beryl, and gold. There is a current operating plan for gold dredging in Dinwoody Creek.

Energy fuels and other leasable minerals are found along the eastern edge of the Forest. Petroleum and natural gas fields are located east of the Washakie and North Absaroka Wildernesses, and north of Dubois. Seismograph work was conducted in the DuNoir Addition of the Washakie during the winter of 1980-81. Coal and geothermal resources are limited. Phosphate beds are located along the east adge of the Forest north of Cody and southwest of Lander.

There are numerous gravel areas, limestone beds, and building stone sites.

Geologic Setting:

The surface rocks of the Forest consist of Absaroka volcanics in the north and an igneous-metamorphic complex in the southern end. Eocene age volcanics were extruded from vent areas or fissure zones onto an irregular surface composed of Paleozoic-Mesozoic rocks and Precambrian metamorphic rocks (Chadwick, 1970). Two northwest trending belts of eruptive centers are located in the northern half of the Forest. The western belt extends from Kirwin to Sylvan Pass (in Yellowstone National Park), while centers at Sunlight Basin, Crandall Mesa, and Cooke City comprise the eastern belt. The intrusives in these belts vary in composition from quartz latite to quartz monzonite. Zones of crustal weakness served as conduits allowing the volcanic and intrusive rocks to reach the surface.

The Absaroka volcanic field is one of the largest created during Eocene time (Smedes, 1972). About 7,000 cubic miles of material were extruded with some of the ash now found as part of the sedimentary strata in the Wind

River Basin. The layered volcanic rocks composing the Washburn, Sunlight, and Thorofare Creek Groups have a maximum thickness of 5000 feet.

Within the northern half of the Forest there are numerous mineralized intrusives. The larger complexes at Stinkingwater, Kirwin, and Meadow Creek are ". . . characterized by a central copper-molybdenum zone surrounded by a halo of silver, gold, lead, zinc, and mercury in peripheral veins" (Fisher, 1981). The remaining areas do not have such a distinct metal zonation or alteration pattern since there was less hydrothermal activity and fracturing of the host rock. The mineralization at the intrusive centers is the final product of the differentiation and evolution of the Eocene magmas.

The southern half of the Forest is distinctly different from the northern half. The Wind River Range from Union Pass south to Atlantic City is a northwest trending anticlinal Precambrian metamorphic complex. During Laramide times, the crystalline core was uplifted and became the basis for today's mountain range. Glaciation, followed by several episodes of uplifting and erosion, created the present topography. On the east flank are Paleozoic and Mesozoic sedimentary beds that dip east into the Wind River Basin.

Locatable Minerals:

ATLANTIC CITY-SOUTH PASS MINING DISTRICT

This mining district was formed in 1842 as the Sweetwater District and included four neighboring areas; Atlantic City, South Pass, Miners Delight, and Lewiston. The district started when placer gold was found along the Sweetwater River. Placering continued until 1867 when gold was found in quartz-arsenopyrite veins of the Carissa Lode. At the height of mining activity in 1871, twelve mills were operating a total of 161 stamps (Spencer, 1916). Placer and lode work continued until 1875, when all activity ceased. Koschmann and Bergendahl (1968) estimate that through 1959 about 70,000 ounces of gold were produced from the lodes and placers of the Atlantic City-South Pass Mining District.

The placers around Miners Delight and Atlantic City were well worked by 1873. About $550,000 in values have been recovered. Beaver Creek, Little Beaver Creek, Smith Gulch, Rock Creek, and Willow Creek are several drainages around the southeast edge of the Forest which were placered.

Initial production at the Carissa Lode was from the rich surface oxide ores. Below the oxidation zone are quartz-gold-arsenopyrite veins that are steeply dipping, northeast trending, and occupy sheared zones in the Precambrian country rock. The Carissa shaft was deepened to 360 feet in 1901 allowing production of 845-fine gold from five levels (Spencer, 1916). The mine has not been active in recent years. Several other lodes of interest are the Miners Delight, Caribou, Garfield, and Victoria Regina (Bayley, 1968).

U.S. Steel produces iron pellets made from taconite mined at Iron Mountain. The Goldman Meadows Formation, a formation of alternating iron-rich and quartz-rich bands, is the taconite source. The iron formation is part of a deep synclinal structure about 4000 feet deep which trends northeast. The iron bed, originally 140 to 160 feet thick, has been thickened by folding and faulting to 300 to 1200 feet for about 4000 feet along the strike (Harrer, 1966).

In 1960, 121 million tons of proven ore (28-32% Fe) and 300 million tons of indicated ore (21-35% Fe) were blocked out (Anon, 1960). U.S. Steel started shipping high-grade taconite concentrate pellets in 1962. Harrer (1966) noted there were reserves of 111 million gross tons of 30% Fe which should produce 42 million gross tons of 65.2% Fe pellets, or about 30 years of production.

Two areas of interest near this mining district, but not on the Forest, are Schiestler Peak and Rennecker Peak (Pearson, et al., 1971, 1979). During 1940, the area around Schiestler Peak was claimed based on the discovery of molybdenum. Molybdenum and copper minerals were found in granitic rocks and some ore was packed out from the west side of Schiestler Peak. There is no current activity. The mineralization, located two miles southwest of Big Sandy Mountain, does not extend across the Continental Divide into the Forest.

There are some abandoned workings on Rennecker Peak. A shaft was sunk in the diorite bedrock next to a diabase dike. There are no veins, alteration, or mineralization visible on the surface. Specks of malachite and chalcopyrite were found on the dump.

The Fire King Asbestos Deposit is located on the southern end of Iron Mountain (Hausel and Holden, 1978; Osterwald, et al., 1966). The half inch long fibers formed in veinlets when hydrothermal solutions reacted within a Precambrian serpentine body. A shaft was sunk, a mill constructed and operated during 1919, and then was closed down the following year. Asbestos uses vary from insulative fabrics to strengtheners in cement, asphalt, and plastics.

About one mile north of Atlantic City are "sandy beds of chiastolite," an opaque variety of andalusite, locally known as "peanut rock" (Osterwald, et al., 1966). The chiastolite is about the size and shape of almond kernels. When heated, the andalusite can be used in alumina-silica refractory work.

WARM SPRING CREEK-DINWOODY CREEK AREA

The Mineral Resource Evaluation of the Glacier Primitive Area by the U.S. Geological Survey found three anomalous lead and heavy metal areas (Granger, et al., 1971). There was widespread, but weak, mineralizing activity with little evidence of alteration or veins. The areas were 1) along the Continental Divide from the headwaters of Warm Spring Creek south to Native Lake, 2) in the headwaters area of Dry Creek, and 3) in the headwaters area of Bull Lake and Middle Fork of Bull Lake Creeks.

The evaluation revealed several areas where sulfides occur (Granger, et al., 1971). An 8 foot wide by 1000 foot long vein which contained silver, copper, lead, and zinc is located near the Ink Wells. Other minerals found include molybdenite in the Dinwoody Lakes area, copper near the headwaters of Wildcat Creek, and talc on the east edge of Goat Flat south of Crater Lake.

The abandoned Clark Mining District was located on Warm Spring Creek west of Dubois. Production by the Clark Placer Mines was limited (Dunnewald, 1958; Schrader, 1913). Several other drainages were worked in 1915 for their placer gold deposits. They included Dry, Bull Lake, and Dinwoody Creeks (Granger, et al., 1971). An operating plan has been approved for gold dredging in Dinwooody Creek in 1982. Antweiler and Love (1967) conducted a study of the gold-bearing sedimentary rocks in northwest Wyoming, including the Wind River Formation, Flathead Formation, and Quaternary stream sediments. Values in Warm Spring Creek and its tributaries ranged from 11 to 220 ppb. Generally, this area has flour gold which cannot be sucessfully recovered commercially by conventional methods.

In addition to gold along Warm Spring Creek, there are also alluvial deposits containing monazite, a thorium mineral. The deposits extend up the South Fork of Warm Spring Creek to the junction with Cow Creek. Precambrian granite at the head of the South Fork is considered the source area (Dunnewald, 1958). Assays of the alluvial deposits show 1.3 to 2.33% ThO_2 (Osterwald, et al., 1966).

Granger (et al., 1971) noted that some uranium ore was mined from a vein along Little Warm Spring Creek in 1956. A total of 6 tons of 20% U_3O_8 was mined from the shallow ore deposit. Additional drilling under a Defense Department contract did not disclose any other discoveries. Wilson (1960) reported that the uranium occurred as fracture plane coatings in quartz-feldspar veins in Precambrian gneiss.

On Red Creek adjacent to the Forest, there is a low grade iron deposit in the Darwin Sandstone Member of the Amsden Formation (Granger, et al., 1971). The deposit, which is made up of lenses several inches thick and several tens of feet across, consists of banded oolitic texture (oolitic: the ground-mass resembles fish eggs) of goethite and hematite, and irregular masses of hematite.

Gilliland (1959) noted large chert masses and travertine deposits near Whiskey Mountain.

KIRWIN MINING DISTRICT

On the southeast end of the western eruptive belt (Chadwick, 1970) is the Kirwin Mining District. This district contains four separate intrusive bodies; Jack Creek, Yellow Ridge, Meadow Creek, and Kirwin. The four areas probably have one common source (Fisher, 1981; Fisher and Antweiler, 1980; Fisher, et al., 1977). In Jack Creek (Gold Reef Mining Region) the sulfide veins show some oxidation and there is a copper geochemical anomaly. Yellow Ridge consists of Tertiary intrusives emplaced into the Wiggins Formation, with a narrow exposure of copper minerals occurring on the southeast slope of Yellow Ridge due to erosion. Ore minerals from the intrusive's central zone include chalcopyrite, bornite, and molybdenite. Another offshoot from this intrusive complex is the granodiorite pluton at Meadow Creek (Wilson, 1975; Bowes, written communication). Disseminated copper mineralization is found in the granodiorite intrusive while narrow, well-defined peripheral veins outcrop north of the intrusive. Meadow Creek may be on the same hydrothermally altered northwest mineralized trend as Kirwin. There are two phases of alteration, and mineralization apparently took place during the later. Bowes (personal communication) indicated that about 5000 feet of drilling has taken place at Meadow Creek.

The Kirwin area was prospected as early as 1881, but the mineralization Will Kirwin discovered in 1890 was probably small copper-lead-silver-gold fissure veins (ROMCOE, 1976). There are about 12,000-15,000 feet of underground workings. Shipments of ore were made in 1903 and 1905 when many claims were being patented. During the 1930's several carloads of ore were shipped from the Little Johnnie Mine. A molybdenum show was reported in 1940 when the Wolf Shaft was sunk. Numerous other prospects and mines are scattered from Canyon Creek south to Bald Mountain. Several of the veins explored include the Smuggler, Tumalum, Pickwick, Oregon, and Bryan No. 3. The Bryan Mine is composed of three tunnels driven to cut four different fracture-fill veins (Osterwald, et al., 1966). Even with all the workings, there are no production records available for this area.

Several firms explored the Kirwin area before AMAX, Inc. acquired the property in 1960. AMAX's work in the area of the Bryan Mine on Bald Mountain has delineated a copper-molybdenum ore body. The measured and indicated reserves total 65-70 million tons of 0.75% copper in addtion to 63.5 million tons of 0.015 molybdenum (Rosenkranz, et al., 1979, World Mining, 1977).

Kirwin consists of copper-molybdenum stockworks and disseminations within hydrothermally altered rocks (Miller and Cooper, 1972). Extensive leaching and oxidation of the stockworks has taken place along with supergene enrichment. The ore body, about 3,800 feet x 2,600 feet in horizontal measurement, is predominantly chalcocite enrichment of chalcopyrite and pyrite. In addition to the enriched central zone, two types of simple fracture-filling epithermal veins exist around the periphery (Fisher; 1981, Wilson, 1980, 1975). These veins contain galena, sphalerite, chalcopyrite, tetrahedrite, gold, pyrite, and molybdenite. Fisher (1981) noted that geochemical sampling of rock outcrops showed anomalously high ore metal values for copper, molybdenum, silver, gold, lead, and zinc.

The fourth offshoot from the intrusive complex is Yellow Ridge, about six miles northwest of Kirwin on the northwest side of Yellow Creek. After the emplacement of the granodiorite intrusives, hydrothermal alteration affected the host Tertiary Wiggins Formation and the intrusive (Fisher, et al., 1977). Copper minerals are exposed in a narrow northeasterly trending exposure on the southeast slope of Yellow Ridge. Malachite occurs as disseminated grains and as coatings on fracture surfaces, along with sulfide minerals, pyrite, chalcopyrite, bornite, and molybdenite.

STINKINGWATER MINING REGION

There are several mineralized intrusives which have been found in this region located in or adjacent to the Washakie Wilderness. From north to south they include; Clouds Home Peak, Deer Creek, Silver Creek, Needle Creek, Birthday Basin, and Robinson Creek (Fisher, 1981; Fisher and Antweiler, 1980; Fisher, et al., 1977). Activity first started in this Region during the 1890's near Needle Creek when several lead-zinc veins were discovered.

The Clouds Home Peak and Deer Creek intrusives are granodiorite to quartz monzonite plutons which were intruded into vent facies and breccias of the volcanic Wiggins Formation. Mineralization at Clouds Home Peak, in the intrusive central zone, consists of chalcopyrite disseminated through the granodiorite with quartz-pyrite stockwork veinlets. In the peripheral veins, there is chalcopyrite and pyrite. Outcrop samples have shown geochemical anomalies for copper, molybdenum, silver, and lead. While Clouds Home Peak has potential for the discovery of valuable deposits, Deer Creek appears to lack such potential, with only pyrite in peripheral veins and a minor copper geochemical anomaly.

The intrusive complex on the South Fork of the Shoshone River may be a common intrusive source for mineralized areas at Silver Creek, Birthday Basin, and Needle Creek. The intrusive compositions vary from granodiorites to andesites to dacites with different degrees of hydrothermal alteration at each site. Silver Creek (Wells, 1982) consists of a copper-molybdenum core in an intensely developed stockwork with a pyrite halo forming the outer edge of mineralization. The 900 feet by 1800 feet exposure of the intrusive central zone contains disseminated malachite, chalcopyrite, bornite, and minor molybdenite (Fisher, et al., 1977). Diamond drilling, while attempting to intercept the stockwork zone during 1979, revealed chalcopyrite and molybdenite minerals (Wells, 1982).

About 12.4 miles south of the South Fork Station is the granodiorite Birthday Basin intrusive emplaced through the Tertiary volcanics (Fisher, 1981; Fisher and Antweiler, 1980). Alteration is limited to patches adjacent to fractures and vein systems. Oxidized minerals are present, but there is no known supergene-enriched zone. Within the central zone of the intrusive, chalcopyrite occurs as disseminated grains, as fracture coatings and in quartz-pyrite veinlets along with some quartz-chalcopyrite stockworks.

The Needle Creek intrusive, located about eight miles south of the South Fork Station, has been well explored over many years. A total of 8,969 feet of core drilling has been completed in addition to several adits that were driven (Wells, 1982; Mining Record, 1980). The intrusive is actually a dacite emplaced in a granodiorite that was mineralized by two separate fracture sets, (Fisher, 1972). Hydrothermal solutions used the intersection of the fracture sets as a conduit to reach the crustal area. Three zones of mineralization have been noted; an oxidized zone of iron and copper oxides, an enriched zone of chalcocite which has been partly eroded by glaciation, and a primary zone of disseminated chalcopyrite with molybdenite and sulfide veins (Wells, 1982; Fisher, 1972). Exploration has not fully determined the ore target, but 65 million tons of 0.35% copper has been delineated so far (Wells, 1982; Mining Record, 1980).

To the west of Needle Creek is an isolated dacite intrusive at Robinson Creek. Geochemical anomalies for copper, molybdenum, and lead have been determined. Chalcopyrite is disseminated in the dacite and in the small peripheral quartz-pyrite veinlets (Fisher, 1981).

EAGLE CREEK AREA

The area was first prospected for placer gold in 1911 by Earl Crouch. Later, Crouch drove an adit 640 feet to intercept the Golden Eagle vein. Other workings can be found in the area. During the 1930's, two gold shipments totaling $1000 were sent to the Denver Mint, but there is no recorded placer production. Only gold and silver could be mined profitably from the Crouch adit (Wilson, 1971; Galey, 1971).

The Tertiary Trout Peak Trachyandesite was intruded by a latite porphyry and andesite dikes. Within a one half square mile area, the volcanic rocks were highly fractured and altered. Finely disseminated grains of pyrite and chalcopyrite occur in the latite porphyry intrusive along with quartz-pyrite stockwork veinlets. Surrounding the intrusive are peripheral sulfide veins. On the surface sulfides have been oxidized to malachite and linarite.

SUNLIGHT BASIN MINING DISTRICT

This district, once known as the Telluride Mining Region, is about 35 miles west of Cody. Wilson (1971) noted that the mineralization is in cirque basins and ridges at the headwaters of Sunlight and Sulphur Creeks which originate on Stinkingwater Peak. The mineralization occurs as vein-filled fractures and as disseminated grains in andesites and near syenite and monzonite intrusive stocks (Nelson, et al., 1980; Hausel, 1980; Parsons, 1937). The mineralized veins contain copper, silver and lead. Minerals in the copper bearing veins included chalcopyrite, pyrite, bornite, tetrahedrite, native gold, sphalerite, and galena, while in the silver-lead bearing veins there is galena, tetrahedrite, stromeyerite, chalcopyrite, native silver, and benjaminite. The disseminated mineralization occurs as pyrite in altered zones, magnetite and chalcopyrite in intrusive stocks, and as stockworks of copper-bearing 1-16mm veins and veinlets.

Prospecting was conducted in 1890 by J. R. Painter, followed by the staking of the Silvertip Group. Between 1890 and 1911, when activity ceased, Lee City was created and 100 metric tons of ore containing gold, silver, copper, and lead(?) were shipped from the Silvertip Group. There is no recorded production from the other mines, some of which were the Winona Group, Evening Star, Newton, and Novelty.

Wideman (1957) reported six sulphur occurrences along Sunlight Creek near Gas Creek and Sulphur Lake. The deposits occur near fumaroles as coatings of minute crystals on rock fragments, or as veinlets, linings, and fillings in limestone cavities. Some metallurgical testing was conducted in the early 1950's, but there has been no production.

COOKE CITY MINING DISTRICT

This mining district, which is centered around Cooke City, Montana, extends into the North Absaroka Wilderness in the Republic Mountain area. The district was started in 1868 with rumors of gold, silver, and lead. Sporadic activity took place until 1940 when the McLaren Mine, north of Cooke City, started producing gold and copper ore. Mining stopped in 1953. Production value was about $4-5 million. (Nelson, et al., 1980).

A zonal arrangement of mineralization occurs in the Paleozoic Gallatin limestones which are covered by Tertiary andesitic volcanic breccia. There are four zones radiating outward from Cooke City, including pyritic gold-copper, pyritic copper-lead, complex lead-zinc-silver, and sideritic calcite-silver (Butler, 1965). The Republic Mountain area is within the complex silver-lead-zinc zone. There were two stages of mineralization in the district, with the first responsible for the bulk of the deposits. There is some dissemination of sphalerite and galena in the wallrock, and some supergene enrichment in the district.

Three mines, Irma, Republic, and Martin, lie on a fissure replacement system marked by outcrops stained with black manganese oxides. The known veins occur near the surface and show alteration which continues with below the known workings. Fissures localized the hydrothermal solutions while a shale member in the Gallatin Formation forced the fluids laterally (Nelson, et al., 1980; Butler, 1965).

The Republic Mine, located three fourths of a mile north of the Wyoming-Montana line, was developed by 3000 feet of mainly opencuts in the limestone. Ore produced from 1923-1949 ranged from 12-40 ounces per ton silver, 4-20 percent lead, and 5-6 percent zinc (Butler, 1965; Reed, 1950).

The Irma Mine, which straddles the Montana-Wyoming line, recorded production of 18,400 tons of gold, silver, copper, lead, and zinc concentrates from 1922-1959. The ore was valued around $600,000 (Nelson, et al., 1980).

The Mohawk-Warrior, northeast of the Republic Mine, was worked during 1926-1927. However, there was no production recorded from the seams of galena, tetrahedrite, and sphalerite (Reed, 1950). Other mines in the area include the O'Hara, Ore Cache, and the Martin claim, which has a shaft and adit to cut ore along a fissure system.

OTHER AREAS

There are two areas of gypsum which trend north-south along the Forest boundary. One is from the Montana-Wyoming state line south for a distance of 60 miles, and the other is about 10 miles south of Cody. The gypsum occurs in a narrow belt within the Jurassic Gypsum Springs Formation which thickens to the south. The deposit consists of alabaster, satin spar, selenite, gypsite, and massive rock gypsum (Bullock, 1964). There are reserves of 1.1 million short tons (Bullock and Wilson, 1969). Wallboard produced in the Cody area is manufactured from the Gypsum Springs Formation.

Several uranium and rare earth occurrences, other than those previously mentioned, are found on the Forest. Uranium occurs in the Flathead Quartzite west of Dead Indian Pass. Grab samples from northwest trending joint sets were assayed at 0.059 to 0.378 percent U_3O_8 (Osterwald, et al., 1966). Exploration work which started in 1980 in this area included three drill holes, but further work on this property is not planned (Gerrow, personal communication). Other radioactive occurrences in the Flathead were found near Russell Peak (Osterwald, et al., 1966). Autunite was found on Belknap Creek near the South Fork of the Shoshone River. The uranium content, occurring along the Cloverly-Morrison contact, ranges between 0.0708 and 0.177 percent (Osterwald, et al., 1966).

Rare earth minerals are found on Bald Ridge north of Dead Indian Pass in Sec. 25, T. 56 N., R. 104 W. The rare earth mineral allanite is found in a pegmatite within Precambrian rocks.

Bentonite beds are found along the eastern edge of the Forest in the Cretaceous Mowry Shale (Hausel, et al., 1979). There was no production in 1980.

Zeolites, which are used in water softeners, are found south of Sunlight Creek and on Deer Creek near the South Fork Station. The zeolite minerals, thomsonite, heulandite, and analcite, are found in basalt flow vesicles and in the weathered zone of a quartz diorite porphyry (Osterwald, et al., 1966).

In the adjacent Beartooth-Absaroka Wilderness portion in Wyoming, there is no known potential for nonmetallic or industrial minerals (Simons, et al., 1979).

Leasable Minerals:

PETROLEUM AND NATURAL GAS

Petroleum and natural gas fields have been found adjacent to the Forest. There are eight fields which produce from Paleozoic sediments. During 1980, 473,060 barrels of petroleum were produced. Natural gas was not produced during 1980, but 11,953 million cubic feet have been produced since the first field was found in 1946 (Wyoming Oil and Gas Conservation Commission, 1981).

The regional stratigraphic and structural pattern suggests the Paleozoic and Mesozoic rocks in anticlinal structures, similar to those in the Big Horn Basin, may exist under the Tertiary volcanic cover in the Washakie Wilderness (Spencer and Dersch, 1981; Love, personal communication).

Several oil seeps have been found, as early as 1913 by D. F. Hewitt, along Sweetwater Creek in the Forest, and in Yellowstone National Park. The presence of mineralized intrusions from Kirwin to Eagle Creek may have disrupted anticlinal structures, but does not indicate that petroleum has been destroyed except for around the intrusive plugs (Love, personal communication). Exploration on the Forest has been limited, but seismographic work was conducted during the winter of 1980-81 in the DuNoir area.

GEOTHERMAL

Geothermal potential is limited to two areas west of Dubois. There are several warm springs near Warm Spring Creek and the mouth of Little Warm Spring Creek. Water comes from the Permian Phosphoria Formation and is about 25°C (Decker, 1976). The energy potential of the springs is limited to local use only.

PHOSPHATE

Phosphate deposits are found along the east flank of the Forest in the Permian Phosphoria Formation. Phosphate is an important fertilizer and consumption is expected to rise with increased food needs (Hausel and Holden, 1978).

The phosphate along the east flank of the Wind River Range is oolitic in texture, dark brown to black when freshly exposed, and cemented by sand grains, clay, and other calcareous materials (Condit, 1924). In a 15 mile stretch along Baldwin Creek, there are 100 million tons of 16.5 percent P_2O_5 and 30 million tons of 24.5 percent P_2O_5 from two different beds (Hausel and Holden, 1978). Other deposits occur in Burroughs Creek and Beaver Creek (Osterwald, et al., 1966; Hausel and Holden, 1978).

COAL

Coal is limited to a subbituminous variety with impurities such as shale partings. The production from the Wilson and Buffalo Coal Groups in T. 51-52 N., R. 101 W. is for local use (Pierce and Andrews, 1941).

Salable Minerals:

Stone slabs from the red facies of the Flathead Sandstone provide a decorative stone for buildings and fireplaces. The stone is being quarried in Sec. 12, T. 41 N., R. 108 W. under special use permit (Granger, et al., 1971). The Madison Limestone in the DuNoir area is also suitable for decorative stone (Prostka, et al., 1979). Sandstone in T. 30 N., R. 99-100 W. is being sold by the Forest Service as a decorative rock.

Decomposed granite, just east of Worthen Meadow Reservoir, provides a road gravel source for the Lander District. An unconsolidated deposit of scoria and volcanic ash, about 500 feet thick over one square mile, is located near Lava Mountain (Osterwald, et al., 1966). There are numerous other sand and gravel deposits scattered around the Forest.

A light grey granite, used for monument stone prior to 1945, is located about 10 miles southwest of Lander in Sinks Canyon (Osterwald, et al., 1966).

Beryl is found in a pegmatite adjacent to the Warm Springs fault zone in Sec. 3, 4, T. 41 N., R. 108 W. (Osterwald, et al., 1966).

AREAS OF FUTURE EXPLORATION

In addition to the current activities described in the locatable and leasable minerals sections, the following areas may be targets for future mineral exploration within the Forest:

1. Atlantic City-South Pass Mining District. The District has hardly been explored below the 200 foot level (Bayley, 1973). The South Pass Greenstone Belt represents a favorable exploration area for economic mineral deposits (Hausel, 1981).

2. Kirwin-Stinkingwater-Eagle Creek. Stockwork and/or vein systems may occur from Kirwin to Eagle Creek wherever intrusives have come in contact with Paleozoic carbonate rocks (Nelson, et al., 1980).

3. Sunlight Mining District. The center of the radiating vein systems could be a possible target area (Wilson, personal communication). Shallow targets would be chalcopyrite-bornite veins while deep potential could be 1) porphyry-type deposits, 2) mineralized breccia pipes, and 3) contact metasomatic deposits (Bergendahl, 1975).

4. Cooke City Mining District. The Gros Ventre Formation, underlying the silver-lead-zinc mineralized Gallatin Limestone, may contain additional mineral deposits (Butler, 1965).

5. Petroleum and natural gas may exist in structures below the Tertiary volcanic cover where intrusives have not destroyed the hydrocarbons (Spencer and Dersch, 1981).

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MINERAL AUTHORITY MATRIX [1]

KINDS OF MINERALS	FEDERAL MINERAL ESTATE STATUS	
	PUBLIC DOMAIN MINERALS	ACQUIRED MINERALS
Locatable Minerals "Valuable minerals" except as noted below.	1872 U.S. Mining Law [2] Prospector and miner have the right to search for and take valuable deposits of "locatable" minerals and to secure title to NFS lands under certain circumstances (FSM 2810). 1974 Secretary of Agriculture 36 CFR 228 Regs. Operator required to submit Notice of Intent or, when significant surface disturbance is anticipated, a Plan of Operation is required (FSM 2810).	1947 Mineral Leasing Act for Acquired Lands Mineral leasing by Interior only with Forest Service consent (FSM 2822).
Leasable Minerals Fossil fuels, other bitumens: Potassium, Sodium, Phosphate, Sulfur in La, and N.M.	1920 Mineral Land Leasing Act Mineral leasing by Interior based on recommendation of Forest Service, except coal which requires FS consent (FSM 2822).	1947 Mineral Leasing Act of Acquired Land Mineral leasing by Interior only with Forest Service consent (FSM 2822).
Geothermal Resources	1970 Geothermal Steam Act Leasing by Interior only with Forest Service consent (FSM 2822).	
Mineral Materials Common variety - sand, clay, gravel, etc.	Act of July 31, 1947 Forest Service cannot dispose of on valid claim without consent of claimant. Can dispose of if claim is declared invalid (FSM 2850).	Act of June 11, 1960 Forest Service authorized to dispose of (FSM 2850).

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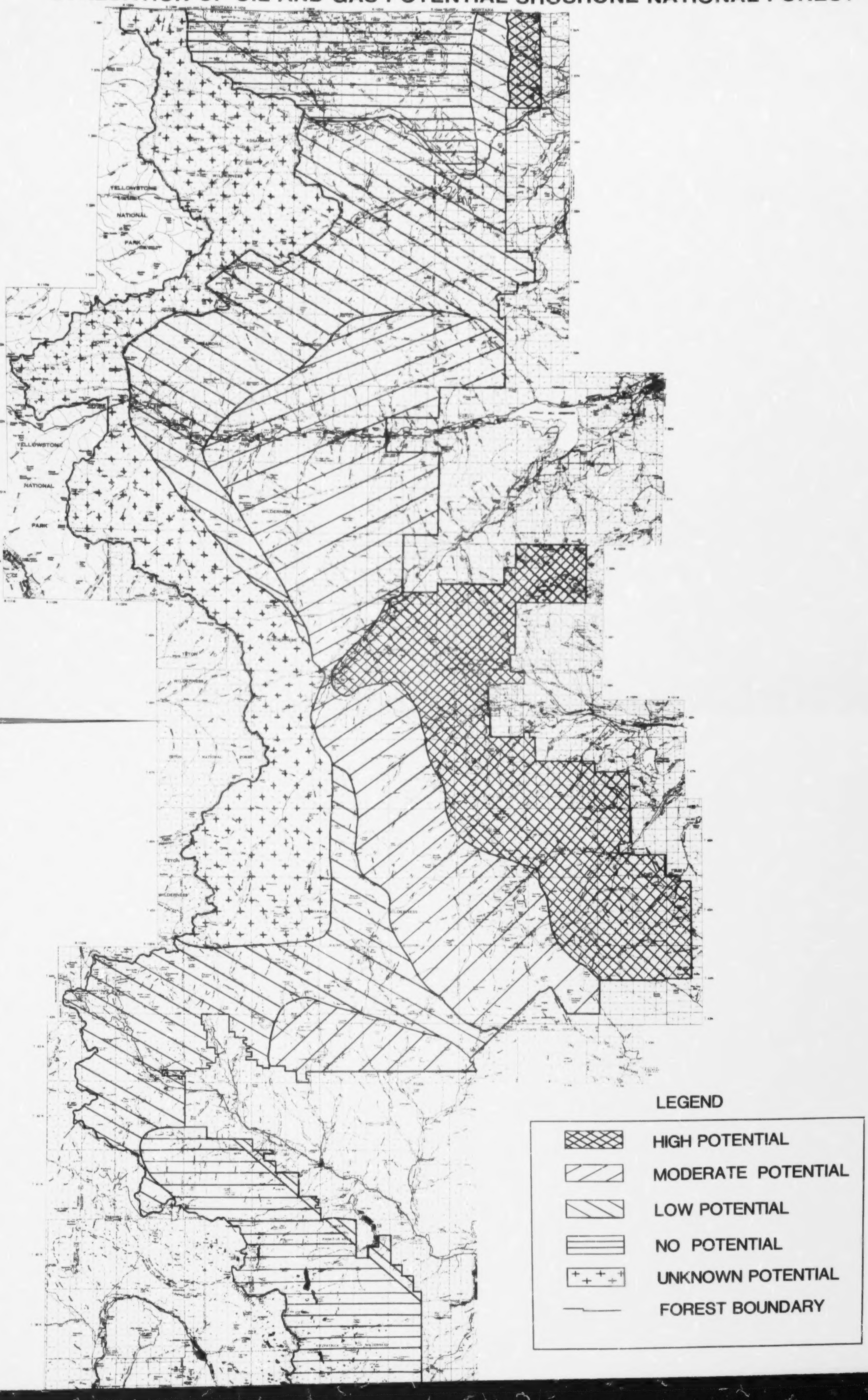
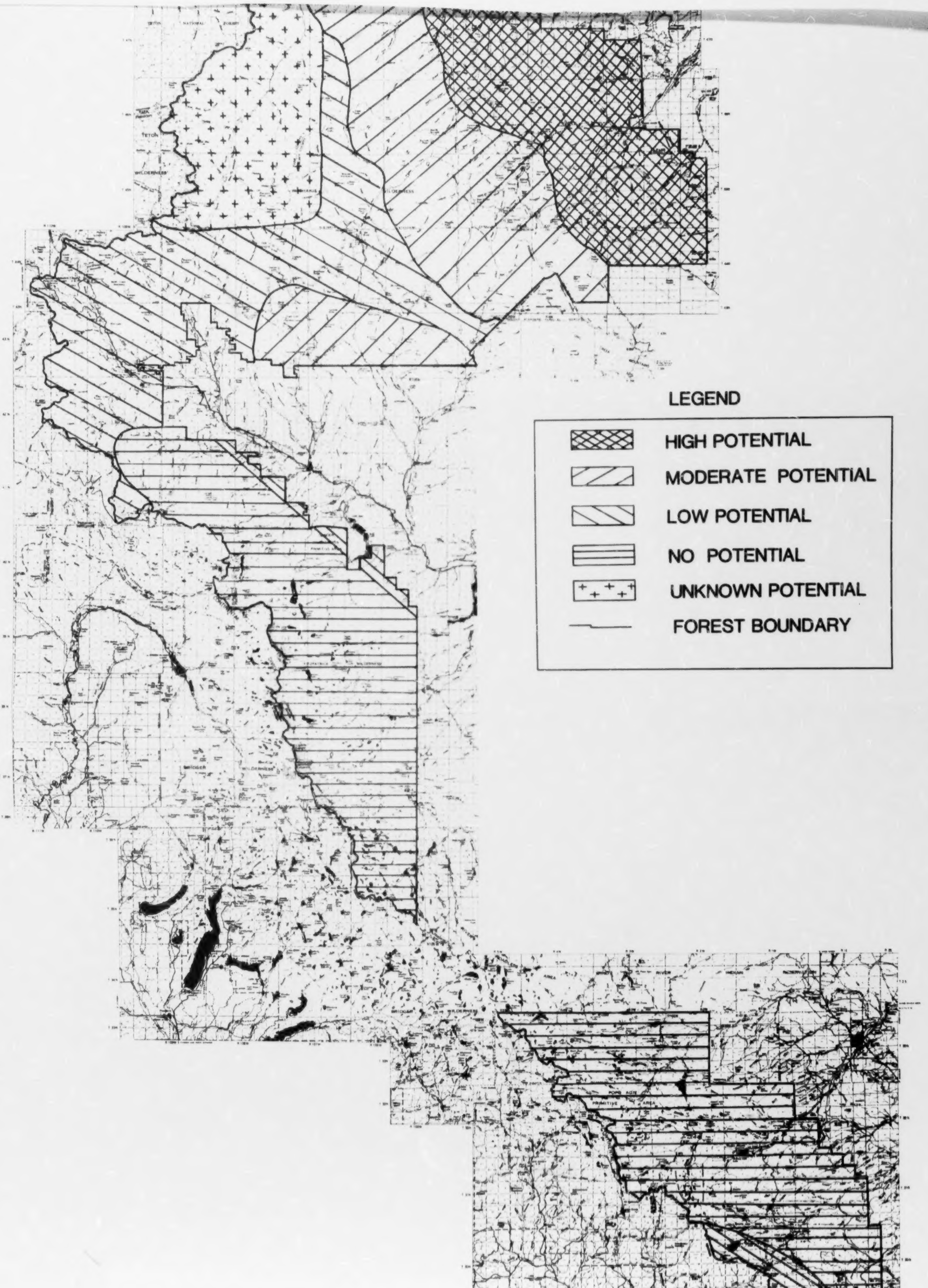
[1] In addition to these Acts concerned with the disposal of minerals and mineral materials, the Forest Service is authorized to issue prospecting permits for activities covered by the Mineral Leasing Acts on lands of the National Forest System.

[2] Includes the 1872 U.S. Mining Law, subsequent Acts of Congress, and case law governing location and patenting of mining claims on the public domain.

EVALUATION OF OIL AND GAS POTENTIAL SHOSHONE NATIONAL FOREST


MONTANA
WYOMING
YELLOWSTONE NATIONAL PARK
YELLOWSTONE NATIONAL PARK
WILDERNESS
TETON WILDERNESS
TETON WILDERNESS
LEGEND
HIGH POTENTIAL
MODERATE POTENTIAL
LOW POTENTIAL
NO POTENTIAL
UNKNOWN POTENTIAL
FOREST BOUNDARY



LEGEND
HIGH POTENTIAL
MODERATE POTENTIAL
LOW POTENTIAL
NO POTENTIAL
UNKNOWN POTENTIAL
FOREST BOUNDARY
TETON WILDERNESS
POPO AGIE PRIMITIVE AREA

APPENDIX E

WIGGINS FORK WILD AND SCENIC RIVER ELIGIBILITY REPORT

Location

With the exception of the lower nine miles, the Wiggins Fork of the Wind River is located entirely on the Shoshone National Forest, in Fremont County, Wyoming.

River Study Area Boundaries

The 1979 Heritage Conservation and Recreation Service (HCRS) Nationwide Inventory for Potential Wild and Scenic Rivers listed the Wiggins Fork of the Wind River from its source to its confluence with the East Fork of the Wind River. This eligibility evaluation only considers that segment of the Wiggins Fork located within the Shoshone National Forest, from its source to T.43N., R.106W., Section 28. This segment includes a corridor one-quarter mile each side of the river's banks. Approximately eight miles of the river is located within the Washakie Wilderness.

General Setting

The action of glaciers and streams on the Absaroka volcanics have created varied topographic features along the river corridor. These volcanics are composed mostly of lava flows, ashes, and conglomerate rock types that have been loosely cemented by water deposited minerals. In the upper reaches, the Wiggins Fork flows through narrow valleys, wet meadows, and bedrock canyons. In the lower reaches, large amounts of rock debris enter into and move down the channel. This debris formed the wide, braided floodplain as well as large rock and soil deposits at the mouths of tributary streams.

Historically, the evaluation area was used by Indians and early day trappers. Evidence of sheep traps, built by the Sheepeater Indians, exists near the corridor today.

The upper eight miles of the river is located within the Washakie Wilderness. With the exception of trails, no development or resource manipulation has occurred in the wilderness.

The nonwilderness portions of the river corridor have experienced intensive timber harvesting operations. Roads and clearcuts are prevalent in the area. The Double Cabin campground and guard station serve administrative and recreation uses that occur near and within the river corridor. The Double Cabin area is used as a major entrance to the Washakie Wilderness. Cattle grazing occurs throughout the corridor south of the wilderness boundary.

Current water developments include a well at the Double Cabin campground and a spring at the guard station. There is one inventoried reservoir site within the river corridor.

Land Ownership and Use

There are approximately 90 acres of privately owned land located within the river corridor. The remaining acres are National Forest system lands.

Land uses within the river corridor consist of timber management near the Double Cabin area, and livestock grazing.

Transportation

Access to the Wiggins Fork is by county and Forest Development roads north from U.S. Highway 26-287. These include the East Fork Road (FDR 500), and the Wiggins Fork Road (FDR 508). There are approximately five miles of Forest Service roads that are located within the river corridor. There are no constructed road, railroad, or bridge crossings within the river corridor. Trails parallel and cross the river along its entire length in the Washakie Wilderness. A primitive road extends from the Forest boundary north for approximately one mile. The road is directly in the river bed and can only be used during low water periods.

Physical-Biological-Geologic Features

There is a variety of topographic features along the Wiggins Fork corridor. This is attributed to the action of glaciers and streams upon geologic parent materials which are composed mostly of extruded Absaroka volcanics. The volcanic materials cover sedimentary rocks, outcrops of which are evident along the river and much of the surrounding area.

The Absaroka volcanics, which prevail in the corridor, are composed mostly of lava flows, ashes, and conglomerate rock types that have been loosely cemented by water deposited minerals. Such rock types are easily weathered and sculpted by wind, water, and glacial action. Accordingly, the higher elevations exhibit glacial features such as steep-sided peaks, cirque basins, high alpine plateaus, and rounded ridges. Mountain slopes are dissected by steep headwater streams, and avalanche and debris chutes.

Major streams contributed to the formation of a variety of topographic features. In the higher reaches, they flow through narrow valleys, wet meadows, and bedrock canyons; lower reaches are characterized by wide, braided floodplains with occasional alluvial bottomlands. Transition zones between ridge tops and valley bottoms include vertical or near vertical rock faces, long colluvial slopes, concave forested slopes, and convex sage-grass slopes. The instability of valley sideslopes has, in many instances, caused alterations in the channel configuration of the streams below. Large amounts of rock debris enter into and move down channels. This debris forms the wide, braided floodplains as well as large rock and soil deposits at the mouths of the tributary streams.

Vegetation within the Wiggins Fork corridor is composed of five broad units: alpine; coniferous forest; montane meadow-parkland; sagebrush-grassland; and riparian.

Alpine vegetation units consist of herblands with low growth forms. It includes the true alpine and near alpine. The true alpine vegetation consists of mountain areas above timberline characterized by perennial herbaceous and shrubby low growing plants, mats of mosses and lichens, and the absence of trees. The near alpine occurs below the true alpine and consists, in addition to the above characteristics, of up to 15 percent coniferous forest canopy. Alpine areas in the near corridor generally occur at elevations greater than 10,000 feet.

Coniferous forests of the river corridor generally consist of Douglas-fir and lodgepole pine (6,500 to 9,000 feet), and Engelmann spruce and subalpine fir (8,000 to 10,000 feet). This vegetation unit is characterized by a generally continuous coniferous forest canopy occurring below alpine and above sagebrush and grassland types. It also includes areas with at least 15 percent forest canopy and an understory of shrubs and herbs.

Montane meadow and parkland vegetation units consist of open areas, exclusive of riparian meadows, occurring within the coniferous forest. Grasses and forbs are dominant and there may be up to 15 percent coniferous or deciduous forest canopy. Deciduous shrubs may also be present.

Sagebrush-grassland units consist of xerophylic grassland and shrubland communities generally occurring between 6,500 and 9,000 feet. Climax grasses and forbs occur in the understories; shrubs (primarily sagebrush) comprise the overstories. They may have an overstory of up to 15 percent coniferous or deciduous forest canopy.

Riparian vegetation is water dependent, occurring in areas directly influenced by standing or running water or high subsurface water tables. Riparian vegetation units are generally characterized by deciduous shrub and tree overstories (e.g., willow, aspen, rose, big sagebrush, cottonwood) with grass, sedge and forb understories.

All surface water in the wilderness portion of the corridor is designated by the Wyoming Department of Environmental Quality as Class I. Class I waters are defined by a particular set of standards designed to maintain quality of water at a high level. Water quality has not been monitored within the corridor to a degree which would allow a definition of baseline conditions. It has been observed that sediment loads are naturally high, rendering the water very turbid during spring runoff.

There are currently no activities or structures in the river corridor to increase water yields or to control the seasonal distribution of runoff.

Floodplains in the corridor vary in width from 50 to 2000 feet. Many of the larger perennial tributaries have vertical cutbanks of varying heights, which are scoured annually, and heavy debris loads. The Wiggins Fork, in addition to the characteristics mentioned above, has a wide floodplain with one or more channels defined in a braid-like pattern. In some cases, these braided channels are interrupted by deep gorges where the gradient becomes steeper and the floodway narrows.

The river corridor provides habitat for some big game species of wildlife. Lower portions of the corridor are crucial elk and moose winter ranges and provide some elk calving areas.

Areas along the river have been identified as potential sites for reintroduction of the American peregrine falcon. Some wilderness portions of the corridor are classified as grizzly bear management situation two areas; remaining portions are classified as grizzly bear management situation five.

Fishing values are low due to a lack of cover, short growing season, unstable channels, spring blowouts, and summer low flows. The river is incapable of sustaining substantial fishing pressure.

A majority of recreation related wildlife and fish use occurs during big game hunting seasons.

Social-Economic Features

Developed recreation opportunities in the corridor are provided by the Double Cabin campground. This campground has a capacity of 75 PAOT's which receives an average of 5,600 RVD's of use per year. Partial trailhead facilities are also available in the area for access to the Washakie Wilderness. Generally, the use season of the developed facilities is approximately 120 days per year.

Dispersed recreation activities in the corridor include viewing wilderness scenery, auto touring, hiking, horseback riding, fishing, camping, picnicking, small and big game hunting, and gathering Forest products. The area's major attraction is the Washakie Wilderness. Some use occurs in the area through outfitter and guiding operations.

Natural scenic features in the corridor include deep vertical gorges and rapids. Terrain is moderately varied with broad but steep slopes and broad valleys at the lower elevations. Smaller canyons and rock features exist that are without distinctive characteristics or color. Some rapids and still pools exist with medium water clarity and a moderate degree of visibility. Vegetation offers some seasonal color but is dominated by wide areas of forest or grass/sage covered slopes. At times, a mixture of the two occurs in nondescript patterns which offer some visual relief. For the most part, the landscape of the corridor is common throughout the Absaroka Mountain Range. Approximately 30 percent of the corridor is classified as variety class A and 70 percent as variety class B.

Wilderness portions of the corridor represent an undisturbed natural landscape. Nonwilderness portions have experienced intensive timber harvesting operations. Clearcuts exceeding 1,000 acres in size represent a major disturbance along parts of the corridor. Smaller clearcuts and other cultural treatments create a disturbed environment along other nonwilderness portions.

The upper reaches of the river corridor contain quantities of petrified and agatized wood that attract collectors. Because of the value of these resources, in place, collection is prohibited above the wilderness boundary.

The area was used by Indians and early day trappers. Evidence of sheep traps, built by the Sheepeater Indians, exists near but outside the river corridor.

Economic uses are related to recreation use, timber and domestic livestock grazing.

Eligibility Evaluation

Free-Flowing Character. The river meets this criteria. There are no major water developments within the study area.

Outstanding Remarkable Values. Motorized and nonmotorized recreation opportunities such as hunting, camping and hiking are available in the area. The quality and quantity of the opportunities offered here are common throughout Northwest Wyoming.

The physical and biological character of the area, as defined by geology, vegetation, water and water quality, and stream channel formation, does not exhibit qualities that are outstanding in comparison to many other river drainages in the area.

Fishing values are low due to a lack of cover, short growing season, unstable channels, spring blowouts and summer low flows. These values are at or below average for Northwest Wyoming.

The variety class inventory illustrates that approximately 30 percent of the river corridor is classified as "Distinctive" and the remaining 70 percent as "Common". This indicates that the esthetic qualities in the study area are common to the Wind River drainage with no remarkable scenic qualities. Existing landscape conditions in a portion of the corridor are dominated by large clearcuts (up to 2,000 acres in size) created during the 1960's.

There are no known cultural resource sites or artifacts in the study area. Some of the study area provides elk and moose winter range and elk calving areas. While these values are important to wildlife, they are not outstandingly remarkable for Northwest Wyoming.

The upper reaches of the river contain quantities of petrified and agatized wood that attract collectors. Because of the value of this resource "in situ" and because of resource damages that have resulted from removal of these materials, collection has been prohibited above the wilderness boundary. This characteristic does not impart a remarkable quality to the river or its environs.

Eligibility Conclusion

The Wiggins Fork of the Wind River does not possess sufficient outstanding remarkable value. Therefore, the river does not qualify for additional study for inclusion in the National Wild and Scenic Rivers System.

As a result of this evaluation and eligibility conclusion, the Shoshone National Forest will develop Forest Plan alternatives for multiple use of the Wiggins Fork corridor.

APPENDIX F

Social Impact Assessment in Forest Planning

APPENDIX F

SOCIAL IMPACT ASSESSMENT IN FOREST PLANNING

With Specific Applications to Shoshone National Forest

August, 1984

Charles Palmer
Thomas Mitchell
Claire Huking

ABSTRACT

Social impact of Forest Plan alternatives are important criteria for ranking the relative value of each alternative to the American public. A procedure for assessing those impacts and providing a quantifiable ranking of alternatives was adapted for use in Forest Planning. This procedure was then tested on the Shoshone National Forest using panels comprised of concerned publics. Results of this effort indicate that this procedure does provide a means for quantifying and ranking alternatives in terms of their social impacts. Further, this procedure can be used prior to the development of alternatives as an aid in developing alternatives which have the best possible social impact given their intent. This procedure, its application on the Shoshone National Forest, and results from this application are presented in this paper.

INTRODUCTION

Social impact analysis has been identified in laws governing forest management as a required component of National Forest planning and decision making. The National Environmental Policy Act of 1969 and the National Forest Management Act of 1976 both require managers to display and consider social effects of alternative actions before chosing a course of action.

These two laws and others such as the Multiple Use Sustained Yield Act of 1960 have formalized a policy of maximizing net public benefit; in other words, providing "the greatest good for the greatest number in the long run". To achieve this, proposed actions and output levels are considered at National (RPA), Regional and Forest levels in terms of cost efficiency, environmental effects, and economic and social impacts.

The Forest Service has developed computer models to analyze the above considerations with the possible exception of social impacts. In the past, social analysis has been done through descriptive methods. These methods have addressed the social environment, but do not address social conflicts or social well-being. In an attempt to provide for more effective social analyses, an approach developed by David M. Freeman of Colorado State University was adapted for use on the Shoshone National Forest. Definitions, assumptions, and procedures described in this report are derived from his publication Management Alternatives for Natural Resources (Freeman, 1981).

Freeman's basic premise is "context of choice", the extent to which individuals are able to exercise their own personal preference and thus increase their social well-being. The methodology used on the Shoshone evaluates the degree to which this opportunity may be threatened as a consequence of implementing alternative Forest Plans.

"Threats" to an individual's choice are analyzed using a concept of polarization. Freeman's approach, as adapted, measures the extent that interest groups in the community are opposed to one another's views without common ground for compromise or incentive to negotiate. Because polarization leaves little room for moderate positions, polarized communities have the potential to create "winners and losers". If a chosen alternative favors one side, the others automatically lose their freedom of choice. Other impacts of polarization include a lower quality of life caused by infighting among groups and destabalization of social institutions, as time, energy, and financial resources are diverted to support "sides" on the issues. These all contribute to lessening the communal or social well-being.

The purpose of this analysis is to determine how Forest Plan alternatives contribute and/or mediate polarization and identity an alternative that promotes the least amount of polarization. There will always be conflict in a community due to competing interests, but the key variable in preventing polarization is an alternative's ability to maintain or foster a willingness on the part of local residents to appreciate the opinions and concerns of others. If a planned management activity prevents their interaction by forcing a "choosing of sides", people on the losing end could have their freedom of choice limited and their social well-being lessened. Greater polarization makes groups struggle for the upper hand and fight to limit the choices of their opponents. Conversely, if an alternative promotes interaction, it improves the freedom of choice and social well-being of all concerned.

PURPOSE

Social impacts of possible Forest Plan alternatives should be considered during planning. To be of greatest use, such considerations should be included before, during, and after alternatives have been created. The purpose of this effort was to develop social data for Forest Planning on the Shoshone National Forest.

The study had four overall objectives: (1) to adapt and test a social impact analysis procedure for use in forest planning; (2) to identify the social impact of three preliminary alternatives; (3) to identify which activity/interest groups ally with other groups and how those alliances shift between alternatives; and (4) to provide a base for developing a socially preferred alternative.

METHODS AND PROCEDURES

The methodology used for the social impact assessment was adapted from procedures developed by David M. Freeman of Colorado State University. This procedure requires involvement of communities surrounding the Forest. They are asked to sit as a panel of judges to review a set of issues and judge how a set of local activity/interest groups would feel about these issues. This is done for current direction (base) and then for each alternative.

After reviewing Freeman's process, and making modifications so it could be applied to the Shoshone National Forest, this process was tested with the Forest management team. This was done to inform the team of how social assessment was going to be done and to fine tune the process before involving the public.

In March, April, and May of 1984, the Forest conducted a series of public meetings regarding social impacts of preliminary Forest Plan alternatives. These meetings were conducted in a series of three, which occured on both the north and south half of the Forest. The focus of the first two meetings was to explain Forest planning and to describe three preliminary alternatives. The third meeting was used to test this procedure for measuring social impacts of proposed Forest Plan alternatives.

The two social impact assessment meetings were held on April 28 in Cody (for the north half of the Forest), and on May 3 in Lander (for the south half of the Forest). Eighteen individuals attended the north half meeting and fifteen attended the south half meeting. Both groups had participants representing a wide variety of interest groups including timber, ranching, oil and gas, outfitting and guiding, and local governments.

The north and south groups both participated in the same process. The first step was to divide each large group into two smaller "panels". Groups were divided randomly; however, individuals with common interests were asked to separate from each other. Each individual was asked to complete a response sheet concerning demographic data, activities/interests, and opinions on their oportunities for involvement in Forest planning. This information was later compiled to show the background of each panel (Appendix A).

At this point, each panel was given a brief introduction to the social impact assessment process. This included a review of issues and activity/interest groups to be evaluated by alternative. The introduction to and detailed explanation of each alternative to be evaluated was presented prior to each evaluation.

A procedure as outlined by Freeman (1981) was used to calculate a base polarization score. In this procedure, panel members were asked to be "judges" and to record their judgements on a score sheet. For example:

Activity/Interest Group	1	2	3	4	5	6	7	8	9
Wilderness Advocates	+	+	+	-	-	+	-	+	+
Timber Industry	+	-	-	+	0	+	-	-	+
Picnickers, Campers & Sightseers	-	-	+	-	+	+	-	+	-
Restaurants & Motels	0	0	+	-	0	-	-	+	+

Judgement scores are:

+ - the activity/interest group is for the issue as stated (e.g. wilderness advocates are judges to be "for" issues 1, 2, 3, 6, 8 and 9.)

- - The activity/interest group is against the issue (e.g. wilderness advocates are judges to be "against" issues 4, 5 and 7).

0 - the activity/interest group is judged to be neutral to the issue (e.g. timber industry is judged to be neutral on issue 5).

The "judging" was done independently by each panel member. Each member was asked to make such judgements for all activity/interest groups on all issues.

Once "judging" was completed, the score sheets were collected and tabulated in terms of how all judges on the panel scored an activity/interest group's response to a single issue. For example:

Activity/Interest Group	Judgements made for issue #1								
Wilderness Advocates	+	+	+	-	-	+	-	+	-
Timber Industry	+	-	-	-	-	-	-	+	-

In this case, 5 panel members felt wilderness advocates would be "for" issue 1, and 4 members felt that this group would be against issue 1.

If there was a great divergence in judgements, such as a 5 - 4 split as shown, the panel members were asked to review everyone's responses as tabulated. Following this review, they were asked to re-judge all issues for all activity/interest groups. There was some confusion at this point. Some participants felt they were being asked to change judgements, for example, so that timber and wilderness advocates were in agreement. What they were asked, though, was to agree on how an activity/interest group such as wilderness advocates would respond to each issue. For example, a consensus similar to the score for timber industry in the previous tables would be desirable. In some cases, panels converged in the first round. When a rating did not converge, a second round of judging was completed.

After this procedure was completed for "base" or current direction, a plan alternative was introduced. Following a presentation of that alternative, the panels were asked to judge how all of the activity/interest groups would respond to each issue if that plan alternative was chosen for implementation. Scoring was done in exactly the same manner as for the base with one addition. Judges were asked to rank how they thought each activity/interest group would feel toward the alternative. For this, a scale of -3 (strongly opposed) to + 3 (strongly in favor of) was used.

This process was followed to determine a base conflict and to determine conflict scores for two alternatives on the north half (commodity and amenity), and for three alternatives on the south half (commodity, amenity, and combination).

Once an alternative was rated and a general agreement reached, conflict patterns associated with that alternative were determined. After this was done for all of the alternatives, resulting conflict patterns and the base conflict pattern were compared.

RESULTS

Information gathered throughout the process could be interpreted in many ways. To meet the objectives, four areas were identified which could provide the most valuable information for forest planning. These four areas are: (1) ranking of alternatives by polarization scores; (2) deviations from the ideal position; (3) ranking of alternatives by overall alternative scores; and (4) identification of polarized groups.

Ranking of Alternatives by Polarization Scores

Based on the "judgements" of each of the four panels, a polarization score was calculated for each alternatives. This same procedure was used to calculate the base conflict score, which can be used to compare alternatives. The following table shows polarization scores (by panel) for each alternative and the base score.

TABLE 1
POLARIZATION SCORES BY ALTERNATIVE

	South Half Panel 1	South Half Panel A	North Half Panel 1	North Half Panel A
Base	75	67	87	78
Alt A (Commodity)	77	81	109	75
Alt B (Amenity)	43	59	81	42
Alt C (Combination)	93	73	--	--

The above polarization scores can only be used to reflect rankings in terms of their desirability in relationship to each other. Scores cannot be used to show intensity. For example, alternative B has a polarization score which ranked lower than that of alternative C. This would identify alternative B as having less polarization than alternative C, but does not identify how much less.

By comparing polarization scores for each alternative, definite trends were found in polarization. The two panels on the north half who evaluated alternatives A and B, both identified alternative B as being the alternative which would result in less polarization. Panel A on the north half identified alternative A as yielding less polarization in comparison to the base, while panel 1 identified alternative A as yielding greater social conflict.

On the south half, there was a little more information to compare because the panel evaluated three alternatives. Through their polarization scores, both panel A and panel 1 identified alternative B as the alternative which would have the least amount of polarization. The score for this alternative was the only score below the base polarization score for both panels. Both panels ranked alternatives A and C as resulting in more polarization than the base. Panel 1 ranked alternative A as having less polarization than alternative C while panel A ranked alternative C as having less polarization than alternative A.

Responses of all four panels can be evaluated to come up with a forest-wide score. North and South half panels came out with a polarization score for alternative B which would indicate that this alternative would result in the least amount of polarization. The north and south panels also identified that both alternatives A and C would increase polarization. This ranking for alternative B by both groups indicates that a "socially preferred alternative" is an alternative emphasizing amenities.

This result was a surprise. Both alternatives A and B represented "extremes", and it was anticipated that both would increase polarization. Further, it was anticiated that the combination alternative representing a "compromise" position would be much lower than either of the others. This was clearly not the case.

Deviations from Ideal Position

Another way to analyze results after calculating polarization scores is to examine how alternatives affected the intensity of polarization for each interest/activity group. The intensity of polarization between interest/activity groups can easily be masked by looking at an overall polarization score. For example, the individuals in the alliance groups often did not change their ratings from base to alternative A. However, the net polarization score increased, at times dramatically. By examining the intensity of polarization for each group, and by looking at the number of deviations from the ideal position, it is possible to trace which groups were effected strongly by an alternative and which groups were unaffected. Appendix B shows deviations from the base and ideal position by interest/group for all of the alternatives.

Identifying how alternatives effected interest/activity groups in this manner provides information which can be useful in designing an alternative to reduce polarization. This is done by identifying features of alternatives that tend to bring activity/interest groups to the "ideal" position. Here the "ideal" is defined as having a 50-50 split of opinions on issues between any pairing of activity/interest groups. If any groups agree or disagree more than 50% of the time, then there is a basis for either allying or "choosing sides". On the other hand, if they split 50-50, there is more room to negotiate and mediate differences. A socially preferred alternative would be composed of features to bring each activity/interest group toward this ideal.

Ranking of Alternatives by Overall Alternative Scores

In addition to rating alternatives according to issues by activity/interest groups, the panels were asked to provide an overall ranking of each alternative for each activity/interest group. These ratings were on a scale of -3, -2, -1, 0, 1, 2, and 3, with -3 being strongly opposed to the alternative, 0 being neutral, and 3 being strongly in favor of the alternative.

Based on this information, it is possible to determine how activity/interest groups feel about each alternative; which activity/interest groups have similar viewpoints; and which groups are opposed to each other.

Table 2 shows the activity/interest groups and a summary of their overall ratings of alternatives. This information indicates which activity/interest groups are in favor of (+3, +2), neutral for (-1, 0, 1), or against (-3, -2) an alternative. Tables 3 and 4 summarize this information in more detail for alternatives A and B.

Appendix C shows the summary of the overall rankings for all of the groups.

Three inferences can be drawn from this information. First is identification of groups who are probable allies; i.e. the groups "for" an alternative are one group of probable allies and the groups "against" are another set of probable allies. The groups listed as neutral are probably not "allies" in that there would be no reason for them to organize and fight for a specific standpoint. They agree and/or disagree with an alternative, but not intensively.

A second inference is identification of the kinds of alternatives which cause intense feelings and are favored by groupings of activity/interest groups. From this information it can be determined which groups are going to have similar viewpoints and opposed viewpoints. Activity/interest groups have basically split into three groups; those in favor of alternatives emphasizing commodities, those in favor of alternatives emphasizing amenities, and those who appear to be neutral. Those oriented towards commodity emphasis are timber, ranchers with permits, seismographic industry, oil and gas industry, retail and wholesale trade, restaurants and motels, and off-road vehicles. Wilderness advocates, hikers and horseback riders, hunting/fishing (Wyoming residents and non-residents), wildlife users, picnicers, campers and sightseers, existing outfitter and guides, and potential outfitter and guides are amenity oriented groups. The remainder are basically neutral toward either one.

TABLE 2
SUMMARY OF OVERALL ALTERNATIVE RANKINGS BY ACTIVITY/INTEREST GROUP

Activity/Interest Group	Alternative		
	A	B	C
Wilderness Advocates	-3	3	-1
Timber Industry	3	-2	0
Ranchers with Permit	2	-2	-1
Ranchers without Permit	1	0	-1
Seismographic Industry	2	-2	-1
Oil and Gas Industry	3	-1	-1
Taxidermy and Meat Processing	-1	1	0
Retail and Wholesale Trade	2	0	1
Restaurants and Motels	2	0	0
Lodges and Commercial Campgrounds	0	1	-1
Picnicers, Campers, and Sightseers	-2	1	0
Existing Outfitters and Guides	-3	1	-1
Potential Outfitters and Guides	-2	-1	-1
Hikers and Horseback Riders	-2	2	-1
Off Road Vehicles	2	-1	0
Snowmobilers	0	0	0
Hunting & Fishing - WY Residents	-2	2	1
Hunting & Fishing - Non-residents	-2	2	1
Non-hunting Wildlife Users	-2	3	-1
Local Government Officials	1	0	0
Adjoining Landowners	-2	0	-1

TABLE 3

ACTIVITY/INTEREST GROUPS WHICH ARE IN FAVOR OF, NEUTRAL, OR AGAINST ALTERNATIVE A

For	Neutral	Against
Timber Industry	Ranchers without Permit	Wilderness Advocates
Ranchers With Permit	Taxidermy & Meat Processing	Picnickers, Campers, Sightseers
Seismographic Industry	Lodges & Commercial Campgrounds	Existing Outfitters & Guides
Oil & Gas Industry	Snowmobilers	Potential Outfitters & Guides
Retail & Wholesale Trade	Local Government Officials	Hikers & Horseback Riders
Restaurants & Motels		Hunting & Fishing - WY. Residents
Off-Road Vehicles		Hunting & Fishing - Non-Residents
		Non-Hunting Wildlife Users
		Adjoining Landowners

TABLE 4

ACTIVITY/INTEREST GROUPS WHICH ARE IN FAVOR OF, NEUTRAL, OR AGAINST ALTERNATIVE B

For	Neutral	Against
Wilderness Advocates	Ranchers without Permit	Timber Industry
Hikers & Horseback Riders	Oil & Gas Industry	Ranchers with Permit
Hunting & Fishing - WY. Residents	Retail & WHolesale Trade	Seismographic Industry
Hunting & Fishing - Non-Residents	Taxidermy & Meat Processing	
Non-Hunting Wildlife Users	Restaurants & Motels	
	Lodges & Commercial Campgrounds	
	Picnickers, Campers, Sightseers	
	Existing Outfitters & Guides	
	Potential Outfitters & Guides	
	Off-Road Vehicles	
	Snowmobilers	
	Adjoining Landowners	
	Local Government Officials	

A third inference that can be drawn from these tables is the intensity of probable polarization for each alternative. In this case, the large increase in the number of groups who are 'neutral" to alternatives B and C implies a lessening of polarization. In other words, by increasing the number of groups who are mildly for/against an alternative, the chances of breaking communitites into opposing sides is lessened. This indicates that those who do feel strongly about such an alternative will find few who will support efforts to fight for their "side". This in turn, tends to lessen the amount of resources that will be diverted from community betterment projects.

Given that there is a limited pool of available donated money, time, and volunteers in any community, lessening the amount diverted to "fight" over Forest management provides greater social well being.

Alternative C, then, has (1) fewer groups choosing polarized sides; and (2) by increasing the number of those "neutral" to this alternative, increases the potential for social betterment programs. These conclusions are not consistent with rankings of alternatives using polarization scores not with results of analysis of deviations from the "ideal" position. Alternative B has a lower polarization score than alternative C, but also has groups who have strong feelings toward that alternative. This indicates that C is a good "compromise" alternative in that it lessens intensity of feeling. However, Alternative C does not lessen polarization, and if chosen, would probably lead to groups organizing on "sides" of issues to lobby for their interests. Alternative B has more conflict, but that conflict on issues is spread in such a way that there are no clear "sides" to be organized. From this point, B appears the better alternative from a social standpoint.

Identification of Polarized Groups

Under ranking of alternatives by base polarization scores, activity/interest groups were identified which tended to be polarized when they were for or against issues given a specific alternative. By comparing additional information, the fact that these groups were indeed polarized was confirmed. This was done by reevaluating some of the original data. In the original calculation of the conflict patterns, one activty/interest group and it's ranking on issues was selected as a base to be compared with the other groups.

Each issue was ranked on whether two activity groups were taking a position of alliance, neutrality, or opposition on the issue. Based on their responses to all issues, a general conclusion was made as to whether a group was allied or opposed to the issue responses of the original group. From this information, general conclusions are made as to which groups would be allied and and which would be opposed, resulting in polarized groups.

Appendix D shows which activity/interest group by each participating group was in favor of, neutral to, or opposed to the response of the base group.

Throughout all three alternatives, the activity groups which were polarized are almost always the same. Under alternative A, the polarized groups are very well defined. One group includes wilderness advocates, taxidermy and meat processors, lodges and commercial campgrounds, picnickers, campers and sightseers, existing outfitters and guides, potential outfitters and guides, hunting/fishing (Wyoming residents and non-residents), adjoining landowners, and hikers and horseback riders. The other group includes seismographic industry, oil and gas industry, retail and wholesale, restaurants and motels, local government officials, timber industry, off-road vehicles, and snowmobiles. All other interest groups are neutral.

Under alternative B, the polarization tends to decrease. This is because some of the groups have become neutralized over all issues. The amenity oriented activities still tend to be well defined. However, the commodity activities have been neutralized. Here, "neutralization" means that they agree/disagree with others at about a 50-50 ratio. Such a split on issues means that there is room to negotiate and a tendancy to work together rather than organize on opposing sides.

CONCLUSIONS

Implications to Forest Planning on the Shoshone National Forest

A purpose of Forest Planning is to create and analyze alternative management plans in search of one that will maximize net public benefits. In this context, a number of implications of this effort appear significant.

From a study of the base conflict patterns on both the north and south halves of the Forest, it appears that activity interest groups are currently polarized over how this forest should be managed. While having local citizens concerned over and involved in management of this Forest is important, having them spend time, money and energy to fight one another in public forums over such management is detrimental to social well being. An implication of this is that there is room for management of this Forest to contribute to social well being by creating and selecting an alternative that will reduce this polarization.

It appears that polarization is between those interested in commodity production on this forest, and those users who focus on non-commodity uses such as wildlife, recreation services and esthetics. Further, these polarized groupings tend to respond and shift as solid blocks; in other words, the same groups tend to ally on all of their responses regardless of the alternative Forest Plan being analyzed or issues presented. An implication of this phenomena is that an alternative which can break up these "blocks" in terms of feelings toward issues will probably decrease polarization. This would occur because of neutralization and/or the forming of new and varied alliances where former adversaries find themselves in agreement on some issues.

From three of the four of scoring alternatives, it appears that the alternative which limited production of commodities to circumstances which would benefit non-commodities such as wildlife and visuals, reduced polarization even though it was an "extreme" alternative. This was in contrast to the increase in polarization associated with the alternative emphasizing production of commodities and the alternative that attempted a compromise.

Implications of this include: that commodity production must be tied carefully to effects on non-commodity outputs; that prescriptions need to be carefully designed to capture the multiple-use nature and benefits of commodity production; that standards for applying practices such as timber management must be tightly defined; that desired forest conditions be carefully designed; that implementation of projects will require an interdisciplinary team to assure compliance with standards; and that effects of projects so designed and implemented should be monitored closely to see if the desired effects are being achieved.

Beyond these implications, there are some applications to the Forest Planning process. First, local publics appear very interested in management of this Forest. This process provides a vehicle by which they can learn more about planning and management while providing valuable input to the planning process. Secondly, this input is very helpful early in the design of prescriptions and alternatives. As noted above, lessons learned from this effort can lead to a refinement and perhaps redesign of prescriptions and can provide information as to the types of alternatives that should be created and analyzed. By going through this process before prescriptions are final and alternatives created, effort that would otherwise be wasted can be directed in much more productive paths. Finally, this is a process that can provide a quantitative look at social impacts of alternatives involving interested publics, and can be supported by documented evidence.

Future Uses of this Process in Forest Planning on the Shoshone National Forest

There are two future uses stemming from the application of this process. The first is to design an alternative that attempts to maximize the beneficial social impacts of forest management. To do this, the panels would be contacted and asked to participate in a design effort. At a meeting with the panels, an alternative designed to maximize beneficial social impacts would be created and then analyzed using this procedure. If it does decrease polarization, it would then be brought forward and perhaps form the basis for an alternative to be analyzed in detail in the Environmental Impact Statement.

A second use of this process is to analyze the social impacts of alternatives analyzed in detail. This would occur at a time when changes can be made to the alternatives. As such, this process could be used with other analysis procedures including economic impact analysis. The actual application of these future steps on the Shoshone National Forest will probably not occur due to time and money constraints.

Recommendations and Modifications for Future Uses

Though the use of this process was limited and was done in a very early stage of analysis, it's use appears to be well worth the effort involved. Benefits include:

1. A better understanding on the part of the public as to what is involved in Forest Planning;
2. The development of a working relationship with the publics involved;
3. A quantified analysis of the social impacts of three preliminary alternatives;
4. Implications for design of prescriptions and alternatives so that social impacts will be beneficial;
5. The development of a framework for incorporating social impact assessment as an "equal" partner with other analyses involved in Forest Planning.

Because of these many benefits, the recommendation is that use of this procedure continue on the Shoshone National Forest, and that other forests interested in this procedure actively pursue it. The opportunity exists to apply the procedure to forest wide activities such as Forest Plans, or to site specific activities such as proposed developments (e.g. a proposed destination ski area).

There are, however, a number of things which need to be changed or clarified before any future uses of the process. They are the following:

1. When splitting the original group into panels, the process seems to work best when there are seven or nine individuals in each group. This size of a group was easy to handle, and seemed to work well together. With an odd number of individuals in each group, there were no ties in the scoring process. Also, each group should be in a separate room.

2. When explaining the process to the participants, the presenters need to be sure that everyone understands the theory behind judging how the activity/interest groups feel about the issues. Many individuals appeared confused as to their role and their own interests in relationship to the groups they were judging. They found it difficult to let go of their own identity and to judge how other interest groups would feel about a specific issue under the identified alternative.

3. Each of the alternatives should be identified in a way which does not identify the emphasis of the alternative. For example, the alternative should be identified as alternative 1 or A rather than the "amenity alternative".

4. Evaluating the alternatives by seperate issues and activity/interest groups proved to be very confusing to participants. This was because issues were listed on one sheet, alternative description on another, and the response rating on another. In order to make a decision, participants had to relate the issue to the alternative description, determine what their rating would be, and then find the proper location for the score on the rating sheet. To simplify this procedure, it would be best to explain each alternative (including the current situation) in terms of issues to be evaluated. After each issue explanation within an alternative description, would be the question asking for a judgement on their position on the issue. For example, after identifying lands to be wilderness within the alternative, there would be the question "would the activity/interest group be in favor of, neutral or against an increase in wilderness on the Shoshone National Forest?"

5. Another confusing point for the participants was the process of converging the scores in the first and second rounds. Some of the individuals thought we were making them agree on an issue rather than simply agreeing on how a specific interest group might feel about an issue under the identified alternative. The presenters need to stress the theory behind what the participants are doing so they will not feel that their own viewpoints on management of the forest are being compromised.

APPENDIX A

RESPONSE SHEET SUMMARY

Each participant completed a response sheet concerning demographic data, activities/interest groups, and opinions on personal effectiveness regarding social policy. Based on their responses, the following summary was compiled.

The total number of participants in both meetings was 33. Approximately two-thirds of the participants were between ages 25 and 44. The remainder were 45 years or older. Males outnumbered females 27 to 6. The predominant educational level was a four-year college degree; this had been attained by 17 individuals. Six more had attended some college and five others had completed graduate/professional school.

Approximately half of the peoople (15) were long-term residents of Wyoming by having lived in the state for over 25 years. The next largest group (8 persons) had lived in the state six to ten years. 17 people participating in the process were from Park County, while 14 were from Fremont County. Only one individual came from outside these two counties; he/she lives in Natrona County. Duration of residence in these counties paralleled the state figures in that the largest group (15) had lived in the same county for over 25 years, followed by the eight people who had lived in their county for six to ten years.

Most participants (12) listed "farm or ranch" as their place of residence followed by the seven people who indicated "rural non-farm or ranch". Approximately one-third of the respondents (10) indicated that Cody was the nearest town or city, followed by Lander (6), and Dubois (5).

Total annual family income was fairly evenly spread among all categories listed. The greatest number of individuals (7) checked the $20,000 - $24,999 category; six chose $30,000 - $34,999; five chose $25,000 - $29,999. Of the remaining, eight were below $20,000 and seven were above $34,999.

Slightly more than one-third of the participants (13) fell into three occupations. These included outfitter/guides, dude rancher, and ranchers. Various managerial/professional occupations accounted for fifteen people. These jobs were related primarily to natural resources (4), administration/management positions (7), and other professional professions (4).

Participants were asked to indicate the degree to which they enjoyed participating in various activities and the frequency with which they were able to pursue them. Backpacking, horseback riding, hunting and fishing, reading, hiking, skiing and photography were mentioned most often as favorite activities; of these, backpacking, fishing and hunting were named as those which were not enjoyed as frequently as desired.

Opinions relative to the desirability, importance and beauty of different items were also solicited. Responses to the various topics were as follows:

1. Snowmobiles - Desirability and importance of snowmobiles were almost evenly divided among the four possible rankings, indicating little or no polarization on the issues. Those rating snowmobiles as ugly outnumbered others by two to one.
2. Wilderness - Wilderness was considered desirable, important and beautiful by virtually every participant.
3. Oil and Gas - This item was judged undesirable and ugly, but respondents realized the economic importance of the industry.
4. Timber Harvest - Responses were evenly divided among all rankings of desirability; the majority realized its importance but also judged it as ugly.
5. Cattle grazing - This item was considered both desirable and important by respondents; opinions were neutral in regard to beauty.
6. Developed Campgrounds - Developed campgrounds were also considered both desirable and important by respondents, opinions were neutral in regard to beauty.
7. Public Planning - This activity was ranked highly desirable and important; opinions were neutral concerning beauty.

The final opinions asked of the participants focused on general feelings of personal effectiveness in regard to social policy and trends. On the whole, respondents indicated that they did not feel powerless when confronted by pressure groups, but felt slightly more helpless regarding societal developments and government decisions.

The final section asked the participants to rate their general feelings of their abilities to protect their personal interests when there was a conflict with other pressure groups, and their abilities to impact government decisions. On the whole, respondents indicated that they did not feel powerless when confronted by pressure groups and that they could have an influence on government decisions.

APPENDIX B

HANDOUTS

Activity/Interest Groups

Timber Industry - individuals who earn their livelihood in logging, hauling timber and in sawmill operations.

Ranchers with Forest Service Grazing Permits - individuals who have a permit for grazing cows, horses, sheep and/or goats on National Forest lands.

Ranchers without Forest Service Grazing Permits - individuals within the local area who earn their livelihood from ranching without permitted use of National Forest lands.

Seismographic Industry - individuals who are involved with all surface and drilling methods (including helicopter) for subsurface data collection.

Oil and Gas Industry - individuals involved in exploring for, developing, producing and processing oil and natural gas products.

Taxidermy and Meat Processers - individuals who process big game meat, hides and heads.

Wholesale and Retail Sales - those who make a living selling to forest users, including those who sell chainsaws, sporting goods, groceries, clothing, vehicles and hardware.

Restaurants and Motels - individuals who own, operate or work in restaurants, bars, motels and hotels.

Lodges and Commercial Campgrounds - individuals who own, operate or work in lodges, dude ranches and privately owned campgrounds.

Picnickers, Campers and Sightseers - people who picnic, camp or sightsee on the Shoshone National Forest.

Existing Permitted Outfitters and Guides - individuals who own, operate and/or work in outfitting and guiding and have a permit to do so on the Forest.

Potential Outfitters and Guides - individuals who desire a permit to outfit and guide on the Forest.

Hikers and Horseback Riders - people who hike, backpack and ride horses on the Forest.

Off Road Vehicle Users - people who drive bicycles, trailbikes and other motorized vehicles (excluding snowmobiles) on the Forest.

Snowmobilers - people who ride snowmobiles on the Forest.

Wilderness Advocates - people concerned with preserving and expanding wilderness.

Hunters and Anglers, Wyoming Residents - people who live in Wyoming and who hunt and fish on the Forest and/or hunt animals which live on the Forest.

Hunters and Anglers, Non-residents - people who do not live in Wyoming, but hunt and fish on the Forest and/or hunt animals which live on the Forest.

Non-hunting Wildlife Users - birdwatchers and wildlife photographers and observers.

Local Government Officials - state, county and city officials.

Adjoining Landowners - individuals who own land bordering the Forest.

Summary of Issues

1. Increase Activities in Situation I areas to help achieve a recovered population of grizzly bears.
2. Increase siesmographic work.
3. Increase oil and gas exploration and development.
4. Increase the number and locations of outfitter and guide operations.
5. Increase public roaded access to and on the Forest.
6. Increase wilderness on the Shoshone National Forest.
7. Increase timber harvests on the Shoshone National Forest.
8. Increase livestock grazing on the Shoshone National Forest.
9. Increase resident wildlife populations by herd unit.

Issues by Alternative

Alternative A

1. Grizzly Bears - Restrictions will occur on recreation and logging activities within situation I, however both will be allowed. Roads not being used for management purposes will be closed.
2. Seismic - Seismic activity would be allowed outside of wilderness.
3. Oil & Gas - All areas outside of situation I capable of withstanding surface occupancy will be open for oil and gas exploration and development. Roads will be allowed except in areas not suited for roaded access.
4. Outfitters and Guides - Moderate increase in the number of permittees and camps.
5. Access - Maximum amount of roads on and access to the Forest.

6. Wilderness - Wyoming Wilderness Bill areas will be managed as wilderness. All other roadless areas will be managed for their highest productivity. This will vary from primitive recreation to timber.

7. Timber - Within standards for wildlife, water and soil, timber will be maximized.

8. Livestock - Highest possible intensity of livestock grazing will be implemented (while meeting wildlife, water and soil minimums), including grazing in wilderness.

9. Wildlife - In some situations where cattle and wildlife are not in direct competition, there will be low to moderate increases in resident populations. In situations where there are oil and gas operations and competition with cattle, there will be low to moderate decreases in wildlife populations.

Alternative B

1. Grizzly Bears - No timber harvesting or roads within situation I. Restrictions on recreation use including the removal of outfitter and guide camps from within situation I.

2. Seismic - Seismic work could be dramaticaly decreased and would emphasize underground drilling type of exploration to decrease noise.

3. Oil and Gas - Exploration and development would be allowed only in areas with a low hazard to soil and water. Roads to support these operations would be kept to a minimum.

4. Outfitters and Guides - No increase in the number of outfitters and guides would occur. There may be a decrease in the number of camps due to removal of operations within situation I and lack of additional sites throughout the remaining forest.

5. Access - Public access will be slightly increased. Roaded areas on the Forest will be decreased.

6. Wilderness - 400,000 acres of land, beyond that in the Wyoming Wilderness Bill will be dedicated to wilderness. All wilderness will be managed for the lowest density level of recreation use possible, with an emphasis on primitive and pristine recreation (few trails and campsites).

7. Timber - Timber harvest will be moderately decreased, done only in situations where it will enhance visual diversity and wildlife habitat. Logging raods will be closed for public access.

8. Livestock - Low to moderate decreases in livestock grazing. Where allowed in wilderness, grazing will be the lowest intensity.

9. Wildlife - Resident populations will be increased.

Alternative C

1. Grizzly Bears - Restrictions will occur on recreation and logging activities within situation I and in the following areas:

   - currently roaded areas on the Clarks Fork and Wapiti districts.
   - on the entire Greybull district, and
   - on most of the Wind River district.

   Roads in these areas not being used for management purposes will be closed.

   No timber harvesting or road constuction within situation I will occur in the following areas:

   - on all currently unroaded portions of the Clarks Fork and Wapiti district
   - on scattered parts of the Wind River district, or
   - on all existing wildernesses and those proposed in the current Wyoming Bill.

   Restrictions will occur on recreation use including the removal of outfitter and guide camps from within situations I.

2. Seismic - Seismic activity would be allowed in the following areas outside of existing wilderness and wilderness proposed in the Wyoming Wilderness Bill:

   - roaded areas on the Clarks Fork and Wapiti districts
   - on the entire Greybull district, and
   - on most of the Wind River district.

   Seismic work would be dramatically decreased and would emphasize underground drilling type of exploration on all currently unroaded portions of the Clarks Fork district, most of the Wapiti and Lander districts, and scattered parts of the Wind River district.

3. Oil and Gas - The following areas which are located outside of the situation I and are capable of withstanding surface occupancy will be open for oil and gas exploration and development:

   - currently roaded areas on the Clarks Fork and Wapiti districts, and
   - the majority of the Greybull and Wind River districts.

   Roads in thses areas will be allowed except for when not suited for roaded access.

   On all currently unroaded portions of the Clarks Fork and Wapiti districts and on the entire Lander district, oil and gas exploration and development would be allowed only in areas with a low hazard to soil and water. Roads to support these operations would be kept to a minimum.

4. Outfitters and Guides - A moderate increase would occur in the number of permittees and camps on the majority of the Greybull and Wind River districts. No increases would occur in the following areas:

- on all currently unroaded portions of the Clarks Fork and Wapiti districts
- on the entire Lander district, and
- on all existing wildernesses and those proposed in the current Wyoming Wilderness Bill.

In these areas there may be a decrease in the number of camps due to removal of operations within situation I and lack of additional sites throughout the remaining Forest.

5. Access - A maximum amount of roads on and access to the Forest will occur on:

   - the currently roaded portions of the Clarks Fork and Wapiti districts, and
   - the majority of the Greybull and Wind River districts.

6. Wilderness - Wyoming Wilderness Bill areas will be managed as wilderness. All other roadless areas wil be managed for the lowest density level of recreation use possible.

7. Timber - Within standards for wildlife, water and soil, timber will be maximized in the following areas:

   - on all currently roaded areas on the Clarks Fork and Wapiti districts, and
   - on the majority of the Greybull and Wind River districts.

   Timber will be moderately decreased, and done only in the following areas where it will enhance visual diversity and wildlife habitat:

   - on all currently unroaded portions of the Clarks Fork and Wapiti districts, and
   - on the Lander district.

   In these areas, logging roads will be closed for public access.

8. Livestock - Within standards for wildlife, water and soil, the highest intensity of livestock grazing will be implemented (including grazing in wilderness) in the following areas:

   - on currently roaded areas on the Clarks Fork and Wapiti districts, and
   - on the majority of the Greybull and Wind River districts.

   Low to moderate decreases in livestock grazing will occur on all currently unroaded portions of the Clarks Fork and Wapiti districts, and on the entire Lander district. In these areas, where grazing is allowed in wilderness, grazing will be the lowest intensity.

9. Wildlife - In some situations where cattle and wildlife are not in direct competition, there will be low to moderate increases in resident populations. In situations where there are oil and gas operations and competition with cattle, there will be low to moderte decreases in wildlife populations. All other areas with no grazing or oil and gas operations will have an increase in resident populations.

APPENDIX C

DETAILED REVIEW OF PUBLIC INVOLVMENT PROCEDURE ON THE SHOSHONE NATIONAL FOREST

Freeman's publication Management Alternatives for Natural Resources (1981) provides a detailed description of the process which we, on the Shoshone National Forest, based our methods and procedures. Individuals using the process should read this document. The following section provides a detailed description of the procedures we used. This discussion will be separated into three sections: (1) preparation for public involvement in social impact assessment; (2) the assessment process; and (3) analysis of data gathered.

Preparation for Public Involvement

Advanced preparation for public involvement in social impact assessment was an important factor in it's overall success. This preparation involved three areas: facilities, handouts, and procedures.

The facilities needed for the process included a good size room for each panel. The process is more convenient to conduct if there is a large room where all groups can meet for orientation and general discussion. Within the room, individuals should be well separated to limit communication. A copying machine will also be needed throughout the process. Basic facilities must also be present, including restrooms, coffee, tables and chairs.

Material given to the praticipants as handouts will be relied on heavily during their analysis and should therefore be well prepared. Further, we found that color coding handouts relieved some confussion; e.g. rather than saying "turn to page 14", we could say "look at the yellow sheets" vs. blue, green, pink, etc. This made it easier for participants to find and follow handouts.

A list identifying issues, as presented on the response sheets, and definitions of the activity/interest groups will help clarify these areas to the participants. Summaries should also be provided of the proposed management alternatives. We found that the participants could relate to the alternative more easily if they were described issue by issue. Following a description of how issues would be dealt with under an alternative should be a question asking if under this alternative would the interest/activity group be in favor, neutral or against the issue statements. We did not do this, but felt that it would have clarified the ranking of the issues by activity groups.

Although copies of maps regarding the alternatives were not handed out, it is a good idea to have copies on hand of any maps which may provide information to the participants. This includes maps specifically for alternatives as well as general inventory maps.

A thorough review of the procedures to be followed is needed prior to the social impact assessment process to insure that the individuals conducting the exercise are aware of each step of the process and have and idea of some of the problems and difficulties which may arise. To insure that we were familar with the process, we conducted this procedure with the Forest management team. This gave us an opportunity to go through the process, fine tune any areas which were confusing, inform the management team of the process, and to field possible questions.

The Social Impact Assessment

Introduction to the process should begin with a welcome and a short overview of social conflict analysis. This overview should be simplified and to the point. The analysis should be highlighted rather than providing a thorough understanding. Participants need to understand the theory behind what they are doing, but if too much information is presented, they will become overloaded and confused.

Depending on the number of issues the forest has identified and how many they want to work with, the participants may at this time have to rank issues in order of importance. Under this procedure, only the top ranking issues would be used. We identified nine issues and dealt with all nine. It would have been easier, however, and less confusing for the participants, had we dealt with around seven issues.

Issues and activity/interest groups are then reviewed to insure that everyone has interpreted them in the same manner. The panels are then asked to move to their assigned rooms to begin work.

After seperating into the panels, participants are asked to complete a response form asking for general background information. This information is gathered and a composite is compiled for each panel (appendix A).

Each individual is asked to consider the identified issues and to estimate the current position (pro, con, or neutral) that each activity/interest group will take toward each issue. This is done to estimate base polarizationn. Each response will be made on the Social Conflict Exercise Response Sheet (Table 5) using the following scale:

-	0	+
against	neutral	for

The top heading should be identified as the base alternative and scores from this round will be calculated the same way as rounds dealing with plan alternatives.

The next step is to estimate conflict patterns associated with proposed management alternatives. We found it effective to provide the brief summary of the proposed management alternatives directly before the conflict exercise. So, instead of presenting all of the alternatives at the initial orientation, each one is discussed immediately before determining the conflict patterns.

After reviewing the alternatives, each participant ranks the estimated position, pro, con, or neutral, that each activity/interest groups will take toward each issue under the alternative being reviewed. This is done the same way as the base polarization, using the Social Conflict Exercise Response Sheet (Table 5). For example, the participants would view themselves as wilderness advocates and would then determine if they would then be for (+), against (-), or neutral (0) for issue #1 under the alternative being evaluated. The participants would continue to evaluate all of the activity/interest groups' outlook on the issues through the role playing process. A degree rating for the overall alternative (column 10) is also made based on each participants judgement of how each activity/interest group would rate the alternative as a whole. This would be on a -3, -2, -1, 0, 1, 2, and 3 scale, with -3 being strongly opposed, 0 being neutral, 3 being in favor of, and the remaining numbers being varing intensities in between.

After the first round of judging is complete, the responses are gathered, keeping the groups seperated, and the information summarized. To summarize the information, a quick cut, tape, and copy job was done. All of the responses were cut to seperate issues; all responses or judgements concerning a single issue were taped onto single sheets, and copies were made to hand back. For example, one sheet had everyones response as to how activity/interest groups felt toward issue #1. Depending on how similar the panels judgements were, the panels may or may not repeat this process for a second or third round. In between rounds, participants would review summary sheets and reevaluate their scores. When there was a convergence of scores on each issue, the panel would move onto the next alternative.

This process is repeated until all alternatives have been ranked and the scores have satisfactorally converged. We found that this process was time consuming. In our first trial, it required approximately eight hours to complete two rounds for base and two alternatives. On the South half, we were able to complete two rounds for base and then one round apiece for three alternatives in approximately seven hours. We found that the convergence which occured in the second round was not significant for the time and effort involved.

Analysis of Data Gathered

Freeman's publication covers, in detail, how to analyze social conflict data, and discusses theory behind the information gathered. This section will deal with how we, on the Shoshone National Forest, interpreted our data and will be separated into: (A) polarization scores and deviation from the ideal; (B) overall alternative scores; and (C) identification of polarized groups.

Polarization Scores and Deviation from the Ideal

Panel composite scores are first determined for judgements of each activity/interest group on each issue for an alternative. The model score of individual judgements within the panel is selected as the panel score for each issue by activity/interest group. All such scores are then compiled on a single score sheet.

A base activity/interest group is selected to be used in determining polarization scores. This group must have the fewest neutral positions on the composite score of issues. Potential and existing outfitter and guides were used in analysis of information gathered on the Shohone National Forest. Each of the composite scores by activity/interest groups are then compared with the base group to determine if they take a position of alliance with, neutrality toward, or opposition to the base activity groups position. For example, wilderness advocates are seen as being either allied with, in opposition to, or neutral with potential outfitter and guides on the given issues. The scores are summarized on the table Conflict Patterns over Existing Base Cleavages (Table 6).

The observed position, identified on table 6, designates the number of issues each activity/interest group is against, for, or neutral with the base activity/interest group. The observed position is then compared to the expectd pattern that would occur ideally if there were a perfect pattern of cross-cutting conflicts. If conflicts were perfectly cross-cutting, one would expect that each activity catagory position to be half the time "for" the base category position and half the time "against". Therefore, given nine cleavages on which the activity catagory is estimated to have taken a non-neutral position, the expected pattern for perfectly cross-cutting positions on the conflict fronts is 4.5/4.5. In those cases where activity users are seen as neutral (0), the expected pattern is based on the total of positive (+) plus negative (-) positions. Consequently, since the ranchers catagory is estimated to be neutral on one cleavage, the expected pattern for ranchers is 4/4.

The point which we are concerned with is how much deviation is there between the observed patterns and the ideal cross-cutting pattern. This is determined by the number of deviations between the observed position and the ideally expected position. For example, if an observed position is 1 for, 5 against, and 3 neutral, then the idealy expected position is 1/2(1+5) or 3/3; deviations from ideally expected position in this case is +2/-2. Because the sign attached to these numbers is not important, the signs are ignored. The number of deviation units is critical, not the deviation direction. Discarding signs, all deviation values are summed, which gives the units of deviation from a pattern of pure cross-cutting conflict. The same process is completed to determine the deviations from the ideal on all of the alternatives.

Overall Alternative Scores

Column 10 of the Conflict Patterns Over Existing Base Cleavages (Table 6) identifies the activity/interest group's view for the alternative as a whole. The ratings were on a scale of -3, -2, -1, 0, 1, 2, and 3, with -3 being strongly opposed to the alternative, 0 being neutral and 3 being in favor of the alternative. Each alternative was rated, the panel scores were compiled, and the alternative scores compiled. Table 2 presents the summary of the overall alternative rankings, and appendix E presents each panel's scores.

Identification of Polarized Groups

Polarized groups were identified by expanding on the information gathered to determine the polarization scores. Under all alternatives and by each group, the response for each activity/interest group toward the given issues were compared with the base group. A list was compiled of those in alliance with, neutral to, or opposed with the base group. Trends quickly developed, identifying which groups were usually in alliance with each other, or opposed to each other. Appendix F presents the summary of the polarized groups by alternatives.

APPENDIX D

DEVIATION FROM IDEAL EXPECTED POSITION

SOUTH HALF - GROUP 1

Activities/Interest Group	Base	Alt. A		Alt. B		Alt. C	
Wilderness Advocates	5	3	(-2)	5	(0)	7	(+2)
Timber Industry	4	2	(-2)	1	(-3)	3	(-1)
Ranchers with Permit	2	0	(-2)	1	(-1)	1	(-1)
Ranchers without Permit	0	1	(+1)	0	(0)	2	(+2)
Seismographic Industry	4	3	(-1)	2	(-2)	4	(0)
Oil & Gas Industry	4	3	(-1)	2	(-2)	4	(0)
Taxidermy & Meat Processing	6	8	(+2)	1	(-5)	7	(+1)
Retail & Wholesale Trade	1	2	(+1)	0	(-1)	2	(+1)
Restaurants & Motels	1	1	(0)	0	(-1)	7	(+6)
Lodges & Commercial Campgrounds	6	4	(-2)	1	(-5)	3	(-3)
Picnickers, Campers & Sightseers	6	7	(+1)	3	(-3)	8	(+2)
Existing Outfitters & Guides	7	7	(0)	5	(-2)	7	(0)
Potential Outfitters & Guides	-	-	-	-	-	-	-
Hikers & Horseback Riders	8	7	(-1)	4	(-4)	8	(0)
Off Road Vehicles	0	4	(+4)	1	(+1)	1	(+1)
Snowmobilers	0	2	(+2)	1	(+1)	0	(0)
Hunting & Fishing - WY. Residents	5	5	(0)	4	(-1)	6	(+1)
Hunting & Fishing - Non-Residents	5	7	(+2)	2	(-3)	8	(+3)
Non-Hunting Wildlife Users	6	6	(0)	5	(-1)	7	(+1)
Local Government Officials	1	2	(+1)	0	(-1)	2	(+1)
Adjoining Landowners	5	3	(-2)	5	(0)	6	(+1)

() - Deviations from the Base

DEVIATION FROM IDEAL EXPECTED POSITION

SOUTH HALF - GROUP A

Activities/Interest Group	Base	Alt. A		Alt. B		Alt. C	
Wilderness Advocates	4	7	(+3)	2	(-2)	6	(+2)
Timber Industry	4	5	(+1)	2	(-2)	3	(-1)
Ranchers with Permit	0	1	(+1)	1	(+1)	2	(+2)
Ranchers without Permit	3	1	(-2)	0	(-3)	0	(-3)
Seismographic Industry	3	5	(+2)	1	(-2)	3	(0)
Oil & Gas Industry	4	5	(+1)	1	(-3)	3	(-1)
Taxidermy & Meat Processing	4	6	(+2)	3	(-1)	3	(-1)
Retail & Wholesale Trade	3	2	(-1)	1	(-2)	1	(-2)
Restaurants & Motels	3	1	(-2)	1	(-2)	0	(-3)
Lodges & Commercial Campgrounds	7	7	(0)	6	(-1)	7	(0)
Picnickers, Campers & Sightseers	3	4	(+1)	7	(+4)	4	(+1)
Existing Outfitters & Guides	6	6	(0)	8	(+2)	7	(+1)
Potential Outfitters & Guides	-	-	-	-	-	-	-
Hikers & Horseback Riders	5	6	(+1)	5	(0)	7	(+2)
Off Road Vehicles	0	3	(+3)	3	(+3)	1	(+1)
Snowmobilers	4	0	(-4)	3	(-1)	1	(-3)
Hunting & Fishing - WY. Residents	2	4	(+2)	4	(+2)	4	(+2)
Hunting & Fishing - Non-Residents	5	7	(+2)	4	(-1)	6	(+1)
Non-Hunting Wildlife Users	4	7	(+3)	3	(-1)	8	(+4)
Local Government Officials	3	2	(-1)	0	(-3)	3	(0)
Adjoining Landowners	0	2	(+2)	2	(+2)	4	(+4)

() - Deviations from the Base

DEVIATION FROM IDEAL EXPECTED POSITION

GROUP 1 - NORTH HALF

Activities/Interest Group	Base	Alt. A		Alt. B	
Wilderness Advocates	7	7	(0)	4	(-3)
Industry	2	6	(+4)	4	(+2)
Ranchers with Permit	0	2	(+2)	4	(+4)
Ranchers without Permit	2	1	(-1)	5	(+3)
Seismographic Industry	4	5	(+1)	6	(+2)
Oil & Gas Industry	3	6	(+3)	6	(+3)
Taxidermy & Meat Processing	5	3	(-2)	2	(-3)
Retail & Wholesale Trade	3	5	(+2)	2	(-1)
Restaurants & Motels	3	7	(+4)	5	(+2)
Lodges & Commercial Campgrounds	6	3	(-3)	4	(-2)
Picnickers, Campers & Sightseers	5	5	(0)	4	(-1)
Existing Outfitters & Guides	-	-	-	-	-
Potential Outfitters & Guides	7	7	(0)	2	(-5)
Hikers & Horseback Riders	8	9	(+1)	6	(-2)
Off Road Vehicles	2	2	(0)	0	(-2)
Snowmobilers	2	3	(+1)	2	(0)
Hunting & Fishing - WY. Residents	7	9	(+2)	6	(-1)
Hunting & Fishing - Non-Residents	5	7	(+2)	6	(+1)
Non-Hunting Wildlife Users	7	9	(+2)	6	(-1)
Local Government Officials	6	5	(-1)	4	(-2)
Adjoining Landowners	3	9	(+6)	4	(+1)

() - Deviations from the Base

DEVIATION FROM IDEAL EXPECTED POSITION

GROUP A - NORTH HALF

Activities/Interest Group	Base	Alt. A		Alt. B	
Wilderness Advocates	5	7	(+2)	0	(-5)
Timber Industry	2	1	(-1)	1	(-1)
Ranchers with Permit	0	1	(+1)	1	(+1)
Ranchers without Permit	1	1	(0)	0	(-1)
Seismographic Industry	3	3	(0)	2	(-1)
Oil & Gas Industry	1	3	(+2)	2	(+1)
Taxidermy & Meat Processing	0	3	(+3)	4	(+4)
Retail & Wholesale Trade	3	2	(-1)	4	(+1)
Restaurants & Motels	1	2	(+1)	2	(+1)
Lodges & Commercial Campgrounds	8	7	(-1)	2	(-6)
Picnickers, Campers & Sightseers	7	5	(-2)	1	(-6)
Existing Outfitters & Guides	-	-	-	-	-
Potential Outfitters & Guides	7	7	(0)	5	(-2)
Hikers & Horseback Riders	8	7	(-1)	3	(-5)
Off Road Vehicles	2	0	(-2)	1	(-1)
Snowmobilers	2	1	(-1)	1	(-1)
Hunting & Fishing - WY. Residents	7	8	(+1)	4	(-3)
Hunting & Fishing - Non-Residents	5	6	(+1)	3	(-2)
Non-Hunting Wildlife Users	7	8	(+1)	3	(-4)
Local Government Officials	6	2	(-4)	2	(-4)
Adjoining Landowners	3	3	(0)	1	(-2)

() - Deviations from the Base

APPENDIX E

SUMMARY OF OVERALL ALTERNATIVE RANKINGS
BY PANEL

Activities/Interest Group	Alt. A				Alt. B				Alt. C	
Wilderness Advocates	-3	-3	-3	-3	3	2	3	3	0	-1
Timber Industry	+3	1	+3	3	-3	-1	-2	-2	-1	1
Ranchers with Permit	2	1	2	2	-1	-1	-2	-2	-2	0
Ranchers without Permit	1	0	1	1	0	0	-1	0	-1	0
Seismographic Industry	3	1	2	3	-3	-1	-1	-2	-1	-1
Oil & Gas Industry	3	1	3	3	-2	-1	-1	-1	-1	-1
Taxidermy & Meat Processing	-1	0	0	-1	+2	0	0	1	0	0
Retail & Wholesale Trade	2	2	3	2	0	0	0	0	1	0
Restaurants & Motels	2	1	3	2	0	0	0	0	0	0
Lodges & Commercial Campgrounds	1	0	0	-2	2	0	2	0	0	-1
Picnickers, Campers & Sightseers	-3	-1	-2	0	1	0	3	1	0	0
Existing Outfitters & Guides	-3	-2	-3	-2	2	0	2	0	-1	0
Potential Outfitters & Guides	-3	-2	-2	-2	-1	0	1	-1	-2	0
Hikers & Horseback Riders	-2	-1	-3	-2	2	1	2	1	-1	-1
Off Road Vehicles	+2	1	2	1	-2	0	-1	-1	0	0
Snowmobilers	0	0	3	0	-1	0	0	0	0	0
Hunting & Fishing - WY. Residents	-2	0	-3	-2	2	0	3	1	1	1
Hunting & Fishing - Non-Residents	-2	-1	-3	-2	2	0	2	1	0	1
Non-Hunting Wildlife Users	-3	0	-3	-2	3	1	2	3	0	-1
Local Government Officials	0	0	1	3	-1	0	0	0	0	0
Adjoining Landowners	-3	0	-2	-1	2	0	0	0	0	-1

3 - Strongly in favor
2 - Moderately in favor
1 - Slightly in favor
0 - Neutral

-1 - Slightly opposed
-2 - Moderately opposed
-3 - Strongly opposed

APPENDIX F

SUMMARY OF POLARIZED GROUPS BY ALTERNATIVES

SOUTH HALF - GROUP A

BASE RANKING

Alliance	Neutral	Opposition
Wilderness	Ranchers with Permit	Timber
Taxidermy	Hunting & Fishing - WY. Residents	Ranchers without Permit
Lodges & Commercial Campgrounds	Adjoining Landowners	Seismograph
Picnickers & Campers	ORV Users	Oil & Gas
Existing Outfitters		Retail & Wholesale
Potential Outfitters		Restaurants & Motels
Hikers and Horseback riders		Local Government
Hunting & Fishing - Non-Residents		
Non-hunting Wildlife users		
Snowmobilers		

COMMODITY ALTERNATIVE

Alliance	Neutral	Opposition
Wilderness	Ranchers with Permit	Timber
Taxidermy	Ranchers without Permit	Seismograph
Lodges & Commercial Campgrounds	Retail & Wholesale	Oil & Gas
Existing Outfitters	Restaurants & Motels	ORV Users
Potential Outfitters	Snowmobilers	Local Government
Hikers & Horseback riders		
Hunting & Fishing - WY. Residents		
Hunting & Fishing - Non-residents		
Adjoining Landownerss		
Picnickers & Campers		

SOUTH HALF - GROUP A
(CONTINUED)

AMENITY ALTERNATIVE

Allliance	Neutral	Opposition
Taxidermy	Wilderness	Timber
Lodges & Commercial Campgrounds	Ranchers with Permit	
Picnickers & Campers	Ranchers without Permit	
Existing Outfitters	Seismograph	
Potential Outfitters	Oil & Gas	
Hikers & Horseback riders	Retail & Wholesale	
ORV Users	Restaurants & Motels	
Hunting & Fishing - WY. Resident	Local Government	
Hunting & Fishing - Non-Resident	Adjoining Landowners	
Non-hunting Wildlife users		
Snowmobilers		

COMBINATION ALTERNATIVE

Alliance	Neutral	Opposition
Wilderness	Ranchers without Permit	Timber
Taxidermy	Retail & Wholesale	Ranchers with Permit
Lodges & Commercial Campgrounds	Restaurants & Motels	Seismograph
Picnickers & Campers	ORV Users	Oil & Gas
Existing Outfitters	Snowmobilers	Local Government
Potential Outfitters		
Hikers & Horseback riders		
Hunting & Fishing - WY. Resident		
Hunting & Fishing _ Non-Resident		
Non-hunting Wildlife users		
Adjoining Landowners		

SOUTH HALF - GROUP 1

BASE RANKING

Alliance	Neutral	Opposition
Wilderness	Ranchers with Permit	Timber
Taxidermy	Ranchers without Permit	Seismograph
Lodges & Commercial Campgrounds	Retail & Wholesale	Oil & Gas
Existing Outfitters	Restaurants & Motels	
Potential Outfitters	ORV Users	
Hikers & Horseback riders	Snowmobilers	
Hunting & Fishing - WY. Residents	Local Government	
Hunting & Fishing - Non-residents		
Non-hunting Wildlife users		
Adjoining Landowners		
Picnickers & Campers		

COMMODITY ALTERNATIVE

Alliance	Neutral	Opposition
Wilderness	Ranchers with Permit	Timber
Taxidermy	Ranchers without Permit	Seismograph
Lodges & Commercial Campgrounds	Retail & Wholesale	Oil & Gas
Picnickers & Campers	Restaurants & Motels	ORV Users
Existing Outfitters		Snowmobilers
Potential Outfitters		Local Government
Hikers & Horseback Riders		
Hunting & Fishing - WY. Residents		
Hunting & Fishing - Non-Residents		
Non-hunting Wildlife users		
Adjoining Landowners		

SOUTH HALF - GROUP 1
(CONTINUED)

AMENITY ALTERNATIVE

Alliance	Neutral	Opposition
Wilderness	Timber	Seismograph
Picnickers & Campers	Ranchers with Permit	Oil & Gas
Existing Outfitters	Ranchers without Permit	
Potential Outfitters	Taxidermy	
Hikers & Horseback Riders	Retail & Wholesale	
Hunting & Fishing - WY. Residents	Restaurants & Motels	
Hunting & Fishing - Non-Resident	Lodges & Commercial Campgrounds	
Non-hunting Wildlife users	ORV Users	
Adjoining Landowners	Snowmobilers	
	Local Government	

COMBINATION ALTERNATIVE

Alliance	Neutral	Opposition
Wilderness	Retail & Wholesaale	Timber
Ranchers with Permit	ORV Users	Seismograph
Ranchers without Permit	Snowmobilers	Oil & Gas
Taxidermy		Restaurants & Motels
Lodges & Commercial Campgrounds		Local Government
Picnickers & Campers		
Existing Outfitters		
Potential Outfitters		
Hikers & Horseback riders		
Hunting & Fishing - WY. Residents		
Hunting & Fishing - Non-Resident		
Non-hunting Wildlife users		
Adjoining Landowners		

NORTH HALF - GROUP 1

BASE RANKING

Alliance	Neutral	Opposition
Wilderness Taxidermy Lodges & Commercial Campgrounds Existing Outfitters Potential Outfitters Hikers & Horseback riders Hunting & Fishing - WY. Residents Hunting & Fishing - Non-Residents Non-hunting Wildlife users Adjoining Landowners Picnickers & Campers	Ranchers with Permit	Seismograph Oil & Gas Retail & Wholesale Restaurants & Motels ORV Users Snowmobilers Local Government Timber Ranchers without Permit

COMMODITY ALTERNATIVE

Alliance	Neutral	Opposition
Wilderness Taxidermy Lodges & Commercial Campgrounds Picnickers & Campers Existing Outfitters Potential Outfitters Hikers & Horseback riders Hunting & Fishing - WY. Residents Hunting & Fishing - Non-Resident Non-hunting Wildlife users Adjoining Landowners	Ranchers with Permit Ranchers without Permit	Timber Seismograph Oil & Gas Retail & Wholesale Restaurants & Motels ORV Users Snowmobilers Local Government

NORTH HALF - GROUP 1
(CONTINUED)

AMENITY ALTERNATIVE

Alliance	Neutral	Opposition
Retail & Wholesale	Wilderness	Timber
Restaurants & Motels	Ranchers with Permit	Seismograph
Lodges & Commercial Campgrounds	Ranchers without Permit	Oil & Gas
Hikers & Horseback riders	Taxidermy	
ORV Users	Existing Outfitters	
Hunting & Fishing - WY. Residents	Potential Outfitters	
Hunting & Fishing - Non-residents	Snowmobilers	
Adjoining Landowners	Local Government	
Non-hunting Wildlife users		
Picnickers & Campers		

NORTH HALF - GROUP A

BASE RANKING

Alliance	Neutral	Opposition
Wilderness	Ranchers with Permit	Timber
Lodges & Commercial Campgrounds	Ranchers without Permit	Seismograph
Existing Outfitters	Oil & Gas	Retail & Wholesale
Potential Outfitters	Taxidermy	ORV Users
Hikers & Horseback riders	Restaurants & Motels	Snowmobilers
Hunting & Fishing - WY. Resident		Local Government
Hunting & Fishing - Non-Resident		
Non-Hunting Wilderness users		
Adjoining Landowners		
Picnickers & Campers		

NORTH HALF - GROUP A
(CONTINUED)

COMMODITY ALTERNATIVE

Alliance	Neutral	Opposition
Wilderness	Timber	Seismograph
Lodges & Commercial Campgrounds	Ranchers with Permit	Oil & Gas
Picnickers & Campers	Ranchers without Permit	Retail & Wholesale
Existing Outfitters	ORV Users	Restaurants & Motels
Potential Outfitters	Snowmobilers	Local Government
Hikers & Horseback riders		
Hunting & Fishing - WY. Residents		
Hunting & Fishing - Non-Residents		
Non-hunting Wildlife users		
Adjoining Landowners		
Taxidermy		

AMENITY ALTERNATIVE

Alliance	Neutral	Opposition
Seismograph	Wilderness	
Oil & gas	Timber	
Taxidermy	Ranchers with Permit	
Retail & Wholesale	Ranchers without Permit	
Restaurants & Motels	Picnickers & Campers	
Lodges and Commercial Campgrounds	ORV Users	
Existing Outfitters	Snowmobilers	
Potential Outfitters	Adjoining Landowners	
Hikers & Horseback riders		
Hunting & Fishing - WY. Residents		
Hunting & Fishing - Non-Residents		
Non-hunting Wildlife users		
Local Government		

LITERATURE CITED

Freeman, David M. 1981. "Management Alternatives for Natural Resources". Colorado State University, Experiment Station. Special Series 18. 98pp.

APPENDIX G

Management Area Direction Used in Formulation of Alternatives, But Not Applied in the Proposed Action

MANAGEMENT AREA 4F

(Provides for Grizzly Bear Enhancement in Current and Potential
Situation 1 Areas)

SUMMARY

Management Emphasis is for grizzly bear populations in excess of recovery levels and to achieve recovery at an accelerated rate.

Vegetative characteristics are dominated by natural ecological process. Specific areas may have evidences of management activities such as prescribed burns and timber harvesting. Tree stand treatments can be clearcut or group selection, but is limited to that necessary to improve grizzly habitat. Grazing by domestic livestock is incidental or may be prohibited.

Recreation and other human activities are regulated or prohibited to favor the needs of the grizzly bear. Outfitter/guide camps and bear baiting are prohibited. Low densities of low standard roads and trails may occur, but are closed either seasonally or yearlong. Leasable and locatable mineral activities are prohibited.

B. MANAGEMENT REQUIREMENTS

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
Visual Resource Management (A04)	1. Design and implement management activities to be subordinate to the natural landscape on non-wilderness lands and natural ecological processes prevalent in wilderness. (1501SH)	a. Do not exceed an adopted visual quality objective of partial retention in non-wilderness and preservation in wilderness. (7315SH)
Dispersed Recreation Management (A14 and 15)	1. Human recreational activities are regulated at low levels or prohibited. (1502SH)	a. Implement mandatory trip issue permits system. (7316SH) b. Bear baiting is prohibited. (7317SH)
	2. Primitive and pristine recreation opportunities are provided in wilderness. (1503SH)	a. Trails will be closed seasonaly or year-long. (7318SH)
	3. Semi-primitive non-motorized semi-primitive motorized and roaded natural influence recreation opportunities are provided outside of wilderness. (1504SH)	a. Roads and trails will be closed seasonally or year-long. (7319SH)
	4. Overnight camping will not be permitted. (1505SH)	
	5. Prohibit motorized vehicle use (including snowmobiles) off Forest System roads and trails. (1506SH)	
Management of Developed Recreation Sites (A08, 09, 11 & 13)	1. All developed recreation sites will be closed. (1507SH)	a. No new developed recreation sites will be allowed. (7320SH)
Recreation Management (Private and Other Public Sector) (A16)	1. All private developed recreation sites are prohibited. (1508SH)	a. Existing sites will be eliminated on permit termination date. (7321SH)
	2. All outfitting/guiding operations are prohibited. (1509SH)	

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
Wildlife and Fish Resource Management (C01)	1. Manage for habitat needs of the grizzly bear. (1510SH)	a. Maintain habitat capability at a level at least 90% of potential capability. (7322SH)
Wildlife Habitat Improvement and Maintenance (C02, 04, 05 and 06)	1. Use silvicultural practices to accomplish grizzly bear habitat objectives outside of wilderness. (1511SH)	
	2. Improve habitat capability through direct treatment of vegetation. (1512SH)	a. Early and mid-seral vegetative stages will be maintained using prescribed burning. (7323SH)
Wildlife and Fish Cooperation With Other Agencies (C12)	1. Manage for grizzly bears in cooperation with the Fish and Wildlife Service, Park Service, and Wyoming Game and Fish. (1513SH)	a. Designate areas as relocation sites. (7324SH)
Range Resource Management (D02)	1. Grazing by domestic cattle and sheep is prohibited. (1514SH)	a. Grazing permits for sheep and cattle will not be reissued after termination date. (7325SH)
Silvicultural Examination and Prescription	1. Manage forest cover types to provide variety in stand size, shape, closure, edge contrast, age structure and interspersion to meet grizzly bear habitat requirements, outside of wilderness. (1515SH)	
	2. Forest cover types outside of wilderness are managed using the following methods: .....clearcut in lodgepole and aspen .....group selection cut in all other cover types. (1516SH)	a. Apply harvest methods to forest cover types as specified in General Direction on at least 80% of the forest cover type. Up to 20 percent of the type may be treated using other appropriate harvest methods specified in Forest Direction. Follow silvicultural standards as specified in Forest Direction Requirements. (7190SH)

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
Mining Law Compliance and Administration (G01)	1. The area is withdrawn from all mineral activity. (1517SH)	
Minerals Management-Oil, Gas and Geothermal (G02 and 04)	1. The area is withdrawn from all mineral activity. (1517SH)	
Minerals Management-Coal, Leasable Uranium and Non-Energy Common Minerals Materials (G03, 05, 06 and 07)	1. The area is withdrawn from all mineral activity. (1517SH)	
Special Use Management (Non-Recreation) (J01)	1. Special uses that conflict with grizzly bear needs will be terminated. (1520SH)	a. A biological evaluation/assessment will be prepared to determine if no effect. (7326SH)
Rights-of-way and Land Adjustments (J02, 13, 15, 16, 17, and 18)	1. Acquire private lands containing essential grizzly bear habitat. (1521SH)	
Transportation System Management (L01 & 20)	1. All motorized travel off Forest Development Roads and trails is prohibited. (1522SH)	
	2. Motorized travel on Forest Development Roads and trails may be prohibited seasonally or yearlong. (1523SH)	

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
Arterial and Collector Road Construction and Reconstruction (L02 thru L09, L16 thru L18)	1. Construction/reconstruction activities are limited to those operations necessary to support habitat improvement activities. (1524SH)	
Local Road Construction and Reconstruction (L11, 12, & 13)	1. Construction/reconstruction activities are limited to those operations necessary to support habitat improvement activities. (1524SH)	
Road Maintenance (L19)	1. Maintain all roads to Level 1. (1525SH)	
Trail Construction and Reconstruction (L22)	1. Trail construction is prohibited. (1526SH)	
Insect and Disease Management/ Suppression (P35)	1. Prevention or suppression of insect and disease populations will be permitted if consistent with grizzly bear habitat requirements. (1527SH)	

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MANAGEMENT AREA 6B

(Emphasis is on Livestock Grazing)

SUMMARY

The area is managed for livestock grazing. Range condition is currently at or above the satisfactory level. Intensive grazing management systems are favored over extensive systems. Range condition is maintained through use of forage improvement practices, livestock management and regulation of other resource activities. Periodic heavy forage utilization occurs. Investment in structural and nonstructural range improvements to increase forage utilization is moderate to high. Structural improvements benefit, or at least do not adversely affect wildlife. Conflicts between livestock and wildlife are resolved in favor of livestock. Nonstructural restoration and forage improvement practices available are seeding, planting, burning, fertilizing, pitting, furrowing, spraying, crushing and plowing. Cutting of encroaching trees may also occur.

Investments are made in compatible resource activities. Dispersed recreational opportunities vary between semiprimitive nonmotorized and roaded natural. Management activities are evident, but harmonize and blend with the natural setting.

B. MANAGEMENT REQUIREMENTS

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
Visual Resource Management (A04)	1. Design and implement management activities to blend with the natural landscape. (0332)	a. Do not exceed an Adopted Visual Quality Objective (VQO) of modification. (6267) b. When projects require clearing of vegetation and (or) soil disturbance, use irregular clearing edges and shapes to blend with the natural landscapes. (6185)
Dispersed Recreation Management (A14 and 15)	1. Semi-primitive nonmotorized, semi-primitive motorized, roaded natural and rural recreation opportunities can be provided. (0445) 2. Provide roaded natural recreation opportunities within 1/2 mile of Forest arterial, collector and local roads with better than primitive surfaces which are open to public travel. Provide semi-primitive motorized recreation opportunities with a low to moderate incidence of contact with other groups and individuals within 1/2 mile of designated local roads with primitive surfaces and trails open to motorized recreation use. Where local roads are closed to public motorized recreation travel, provide for dispersed non-motorized recreation opportunities. Manage recreation use to provide for the incidence of contact with other groups and individuals appropriate for the established ROS class. Provide semi-primitive non-motorized recreation opportunities in all areas more than 1/2 mile away from roads and trails open to motorized recreation use. (0650)	a. Maximum Use and Capacity Levels are: Recreation use and capacity range during the snow-free period (PAOT/acre): Trail use and capacity range (PAOT/mile of trail):

Capacity Range

Use Level	Very Low	Low	Moderate	High
ROS Class - Semi-Primitive Nonmotorized				
On Trails PAOT/mile	2.0	3.0	9.0	11.0
Area-wide PAOT/acre	.004	.008	.05	.08

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Dispersed Recreation Management (A14 and 15)		ROS Class - Semi-Primitive Motorized

On Trails PAOT/mile	2.0	3.0	9.0	11.0
Area-wide PAOT/acre	.004	.008	.05	.08

ROS Class - Roaded Natural

On Trails PAOT/mile	-	-	-	-
Area-wide PAOT/acre	.04	.08	1.2	2.5

ROS Class - Rural

On Trails PAOT/mile	-	-	-	-
Area-wide PAOT/acre	.5	.8	5.0	7.5

Reduce the above use level coefficients as necessary to reflect usable acres, patterns of use, and general attractiveness of the specific management area type as described in the ROS Users Guide, Chapter 25.

Reduce the above use levels where unacceptable changes to the biophysical resources will occur.
(6402)

b. Specify off-road vehicle restrictions based on ORV use management (FSM 2355, R2 Supp. 88).
(6083)

c. See FSM 2331, FSM 7732.

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Dispersed Recreation Management (A14 and 15)		FSH 7709.12 (Trails Handbook), FSH 7109.11a and 11b (Sign Handbook). (6226)
	3. Permit undesignated sites in Frissell condition class 1 through 3 where unrestricted camping is permitted. (0174)	
	4. Manage site use and occupancy to maintain sites within Frissell condition class 3 except for designated sites which may be class 4. Close and restore class 5 sites. (0175)	
	5. Prohibit motorized vehicle use (including snowmobiles) off Forest System roads and trails in alpine shrub and Krummholz ecosystems. Prohibit motorized vehicle use off Forest System roads and trails (except snowmobiles operating on snow) in other alpine, and other ecosystems, where needed to protect soils, vegetation, or special wildlife habitat. (0154)	
Wildlife and Fish Resource Management (C01)	1. Maintain habitat capability for management indicator species. (0329)	a. Maintain capability at 60 percent of potential capability. (6186)
Range Resource Management (D02)	1. Use only intensive grazing systems or remove livestock when recovery of range condition cannot be accomplished by an intensive grazing system. (0325)	
	2. Improve range condition to fair or better or forage value rating to moderately high or better. (0326)	a. Base range condition on the standards in Range Analysis Handbook (FSH 2209.21). (6156) b. Range condition standards are further defined in "Grassland and Shrubland Habitat Types of the Shoshone National Forest". (7303SH)

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Range Resource Management (D02)	3. Invest in cost-effective allotment management and associated range improvements. (0327)	a. Base economic analysis on Project Effectiveness Analysis Handbook (FSH 2209.11). (6290)
	4. Invest in cost-effective grazing management and rangeland productivity improvements. Where improvements include water developments, a water right in the name of the United States must be obtained. (0328)	a. Structural improvements will not adversely affect big-game movement. (6182)
Silvicultural Examination and Prescription	1. Maintain and manage forested inclusions to provide a high level of forage production, wildlife habitat, and diversity. (0333)	
	2. Manage Forest Cover Types using the following harvest methods: - Clearcut in aspen, - Shelterwood in lodgepole pine and ponderosa pine, and - Selection in Engelmann spruce and mixed conifers. (0502)	a. Apply harvest treatments to forest cover types as specified below on at least 80 % of the forest cover type. Up to 20 percent of the type may be treated using other harvest methods specified in Forest Direction. (6074) b. Silvicultural Standard:

Forest Cover Type	Regeneration Cutting Method	Rotation Age
lodgepole pine	Shelter-wood	90-140 yrs.
Engelmann spruce-subalpine fir	Selection	N/A
Interior ponderosa pine	Shelter-wood	100-180 yrs.

MANAGEMENT ACTIVITIES | GENERAL DIRECTION | STANDARDS & GUIDELINES

CONTINUATION OF:
Silvicultural
Examination
and
Prescription

mixed conifer	Selection	N/A
aspen	Clearcut	80-120 yrs.

Apply release and weeding as needed to improve visual quality.
(6063)

3. Utilize firewood material using both commercial and noncommercial methods.
(0147)

4. For management purposes, a cut-over area is considered an opening until such time as:

- Increased water yield drops below 50 percent of the potential increase;
- Forage and/or browse production drops below 40 percent of potential production;
- Deer and elk hiding cover reaches 60 percent of potential;
- Minimum stocking standards by forest cover type and site productivity are met; and
- The area appears as a young forest rather than a restocked opening, and takes on the appearance of the adjoining characteristic landscape.

(0500)

a. When the Visual Quality Objective of an area is modification or maximum modification, the regenerated stand shall meet or exceed all of the following characteristics before a cut-over area is no longer considered an opening:

Forest Cover Type	Minimum Stocking Level (Trees/acre)	Tree Stand Height (ft.) 1/
Inland Ponderosa Pine	190	6
Mixed Conifers	190	6
Lodgepole Pine	150	6
Engelmann Spruce-Subalpine fir	150	6
Aspen	300	6

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Silvicultural Examination and Prescription		

Forest Cover Type	Crown Closure (Percent)	Distribution 2/
Inland Ponderosa Pine	30	70%
Mixed Conifers	30	75%
Lodgepole Pine	30	75%
Engelmann Spruce-Subalpine fir	30	75%
Aspen	30	75%

1/ Applies to trees specified as minimum stocking level.

2/ Percent of plots or transects that are stocked.

(6014)

MANAGEMENT AREA 7C

(Emphasis is on Management of Forested Areas on Steep Slopes)

SUMMARY

Management emphasis is to develop and maintain healthy tree cover on forested slopes greater than 40 percent. The harvest method by forest cover type is clearcutting in aspen, lodgepole pine, interior ponderosa pine and mixed conifers and group selection in Engelmann Spruce-subalpine fir.

Management activities, although visually dominant, harmonize and blend with the natural setting.

Roaded natural recreation opportunities are provided along forest arterial and collector roads. Semiprimitive motorized recreation opportunities are provided on those local roads and trails that remain open, semiprimitive nonmotorized opprtunities are provided on those that are closed.

B. MANAGEMENT REQUIREMENTS

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
Visual Resource Management (A04)	1. Meet stated visual quality objective. (0125)	a. Do not exceed an Adopted Visual Quality Objective (VQO) of: Partial retention within the foreground of arterial/collector roads and primary trails. Modification on all other areas. (6067) b. Apply rehabilitation practices where the above objectives are not currently being met. (6068)
Dispersed Recreation Management (A14 and 15)	1. Semi-primitive nonmotorized, semi-primitive motorized, roaded natural and rural recreation opportunities can be provided. (0445)	
	2. Provide roaded natural recreation opportunities within 1/2 mile of Forest arterial, collector and local roads with better than primitive surfaces which are open to public travel. Provide semi-primitive motorized recreation opportunities with a low to moderate incidence of contact with other groups and individuals within 1/2 mile of designated local roads with primitive surfaces and trails open to motorized recreation use. Where local roads are closed to public motorized recreation travel, provide for dispersed non-motorized recreation opportunities. Manage recreation use to provide for the incidence of contact with other groups and individuals appropriate for the established ROS class. Provide semi-primitive non-motorized recreation opportunities in all areas more than 1/2 mile away from roads and trails open to motorized recreation use. (0650)	a. Maximum Use and Capacity Levels are: Recreation use and capacity range during the snow-free period (PAOT/acre): Trail use and capacity range (PAOT/mile of trail):

	Capacity Range			
Use Level	Very Low	Low	Moderate	High
ROS Class - Semi-Primitive Nonmotorized				
On Trails PAOT/mile	2.0	3.0	9.0	11.0
Area-wide PAOT/acre	.004	.008	.05	.08

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Dispersed Recreation Management (A14 and 15)		ROS Class - Semi-Primitive Motorized On Trails PAOT/mile 2.0 3.0 9.0 11.0 Area-wide PAOT/acre .004 .008 .05 .08 ROS Class - Roaded Natural On Trails PAOT/mile - - - - Area-wide PAOT/acre .04 .08 1.2 2.5 ROS Class - Rural On Trails PAOT/mile - - - - Area-wide PAOT/acre .5 .8 5.0 7.5 Reduce the above use level coefficients as necessary to reflect usable acres, patterns of use, and general attractiveness of the specific management area type as described in the ROS Users Guide, Chapter 25. Reduce the above use levels where unacceptable changes to the bio-physical resources will occur. (6402) b. Specify off-road vehicle restrictions based on ORV use management (FSM 2355, R2 Supp. 88). (6083)

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Dispersed Recreation Management (A14 and 15)		c. See FSM 2331, FSM 773.2, FSH 7709.12 (Trails Handbook), FSH 7109.11a and 11b (Sign Handbook). (6226)
	3. Permit undesignated sites in Frissell condition class 1 through 3 where unrestricted camping is permitted. (0174)	
	4. Manage site use and occupancy to maintain sites within Frissell condition class 3 except for designated sites which may be class 4. Close and restore class 5 sites. (0175)	
	5. Prohibit motorized vehicle use (including snowmobiles) off Forest System roads and trails in alpine shrub and Krummholz ecosystems. Prohibit motorized vehicle use off Forest System roads and trails (except snowmobiles operating on snow) in other alpine, and other ecosystems, where needed to protect soils, vegetation, or special wildlife habitat. (0154)	
Wildlife Habitat Improvement and Maintenance (C02, 04, 05 and 06)	1. Maintain existing natural shrub and grassland openings unless treatment is designed to benefit wildlife. (1120SH)	
Range Improvement and Maintenance (D03, 04, 05 and 06)	1. Protect regeneration from livestock damage. (0133)	
Silvicultural Examination and Prescription	1. Manage forest cover types using the following harvest methods: - Clearcut in aspen and lodgepole. - Shelterwood in interior ponderosa pine, mixed conifer and Engelmann spruce-subalpine fir. (0463)	a. Apply harvest methods to forest cover types as specified in General Direction on at least 80% of the forest cover type. Up to 20 percent of the type may be treated using other appropriate harvest methods specified in Forest Direction. Follow silvicultural

MANAGEMENT ACTIVITIES | GENERAL DIRECTION | STANDARDS & GUIDELINES

CONTINUATION OF:
Silvicultural
Examination
and
Prescription

2. Clearcuts may be applied to dwarf mistletoe infected stands of any forest cover type.
(0138)

3. Apply intermediate treatments to maintain growing stock level standards.
(0140)

4. Utilize firewood material using both commercial and noncommercial methods.
(0147)

5. For management purposes, a cut-over area is considered an opening until such time as:

- Increased water yield drops below 50 percent of the potential increase;
- Forage and/or browse production drops below 40 percent of potential production;
- Deer and elk hiding cover reaches 60 percent of potential;
- Minimum stocking standards by forest cover type and site productivity are met; and
- The area appears as a young forest rather than a restocked opening, and takes on the appearance of the adjoining characteristic landscape.

(0500)

standards as specified in Forest Direction Requirements.
(7190SH)

a. When the Visual Quality Objective of an area is modification or maximum modification, the regenerated stand shall meet or exceed all of the following characteristics before a cut-over area is no longer considered an opening:

Forest Cover Type	Minimum Stocking Level (Trees/ acre)	Tree Stand Height (ft.) 1/
Inland Ponderosa Pine	190	6
Mixed Conifers	190	6
Lodgepole Pine	150	6
Engelmann Spruce-		

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Silvicultural Examination and Prescription		

Subalpine fir	150	6
Aspen	300	6

Forest Cover Type	Crown Closure (Percent)	Distribution 2/
Inland Ponderosa Pine	30	70%
Mixed Conifers	30	75%
Lodgepole Pine	30	75%
Engelmann Spruce-Subalpine fir	30	75%
Aspen	30	75%

1/ Applies to trees specified as minimum stocking level.
2/ Percent of plots or transects that are stocked.

(6014)

b. When the Visual Quality Objective of an area is partial retention, the regenerated stand shall meet or exceed all of the following characteristics before a cutover area is no longer considered an opening:

Forest	Minimum	Tree

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Silvicultural Examination and Prescription		

Cover Type	Stocking Level (Trees/ acre)	Height 1/ (% of the adjacent mature stand height)
Inland Ponderosa Pine	190	25
Mixed Conifers	190	25
Lodgepole Pine	150	25
Engelmann Spruce - Subalpine fir	150	25
Aspen	300	25

Forest Cover Type	Crown Closure (Percent)	Distribution 2/
Inland Ponderosa Pine	30	70%
Mixed Conifers	30	75%
Lodgepole Pine	30	75%
Engelmann Spruce-Subalpine fir	30	75%
Aspen	30	75%

1/ Applies to trees specified as minimum stocking level.

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Silvicultural Examination and Prescription		2/ Percent of plots or transects that are stocked. (6316)

MANAGEMENT AREA 9B

(Emphasis is on Increased Water Yield through Vegetation Manipulation)

SUMMARY

Management emphasis is on increased water yield and improved timing of flow through manipulation of forest vegetation. The location, shape and size of vegetation treatment areas are specifically designed to accomplish this emphasis. Clearcutting is the harvest method used with all forest cover types. Management activities in foreground, middleground and background may dominate, but harmonize and blend with the natural setting.

Livestock grazing occurs but not to the point that regeneration of forested areas or water yield objectives are impaired. Semiprimitive recreation is the predominate recreation use. Motorized travel may be prohibited.

B. MANAGEMENT REQUIREMENTS

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
Visual Resource Management (A04)	1. Management activities in foreground and middleground dominate, but harmonize and blend with the natural setting Management activities may also dominate but appear natural when seen as background. (0263)	a. Do not exceed an Adopted Visual Quality Objective (VQO) of modification. (6267)
Dispersed Recreation Management (A14 and 15)	1. Semi-primitive nonmotorized, semi-primitive motorized, roaded natural and rural recreation opportunities can be provided. (0445)	
	2. Provide roaded natural recreation opportunities within 1/2 mile of Forest arterial, collector and local roads with better than primitive surfaces which are open to public travel. Provide semi-primitive motorized recreation opportunities with a low to moderate incidence of contact with other groups and individuals within 1/2 mile of designated local roads with primitive surfaces and trails open to motorized recreation use. Where local roads are closed to public motorized recreation travel, provide for dispersed non-motorized recreation opportunities. Manage recreation use to provide for the incidence of contact with other groups and individuals appropriate for the established ROS class. Provide semi-primitive non-motorized recreation opportunities in all areas more than 1/2 mile away from roads and trails open to motorized recreation use. (0650)	a. Maximum Use and Capacity Levels are: Recreation use and capacity range during the snow-free period (PAOT/acre): Trail use and capacity range (PAOT/mile of trail):

Capacity Range

Use Level	Very Low	Low	Moderate	High
ROS Class - Semi-Primitive Nonmotorized				
On Trails PAOT/mile	2.0	3.0	9.0	11.0
Area-wide PAOT/acre	.004	.008	.05	.08
ROS Class - Semi-Primitive Motorized				
On Trails PAOT/mile	2.0	3.0	9.0	11.0
Area-wide				

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES				
CONTINUATION OF: Dispersed Recreation Management (A14 and 15)		PAOT/acre	.004	.008	.05	.08
		ROS Class - Roaded Natural				
		On Trails PAOT/mile	-	-	-	-
		Area-wide PAOT/acre	.04	.08	1.2	2.5
		ROS Class - Rural				
		On Trails PAOT/mile	-	-	-	-
		Area-wide PAOT/acre	.5	.8	5.0	7.5
		Reduce the above use level coefficients as necessary to reflect usable acres, patterns of use, and general attractiveness of the specific management area type as described in the ROS Users Guide, Chapter 25.				
		Reduce the above use levels where unacceptable changes to the bio-physical resources will occur. (6402)				
		b. Specify off-road vehicle restrictions based on ORV use management (FSM 2355, R2 Supp. 88). (6083)				
		c. See FSM 2331, FSM 7732, FSH 7709.12 (Trails Handbook), FSH 7109.11a and 11b (Sign Handbook). (6226)				

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Dispersed Recreation Management (A14 and 15)	3. Permit undesignated sites in Frissell condition class 1 through 3 where unrestricted camping is permitted. (0174)	
	4. Manage site use and occupancy to maintain sites within Frissell condition class 3 except for designated sites which may be class 4. Close and restore class 5 sites. (0175)	
	5. Prohibit motorized vehicle use (including snowmobiles) off Forest System roads and trails in alpine shrub and Krummholz ecosystems. Prohibit motorized vehicle use off Forest System roads and trails (except snowmobiles operating on snow) in other alpine, and other ecosystems, where needed to protect soils, vegetation, or special wildlife habitat. (0154)	
Wildlife Habitat Improvement and Maintenance (C02, 04, 05 and 06)	1. Maintain wildlife habitat effectiveness. Permanent openings may be employed. Reduce disturbance to wildlife so that no significant long-term negative wildlife effects result. (0155)	
Silvicultural Examination and Prescription	1. Harvest forest cover types using the clearcut harvest method. (0265)	a. Apply harvest treatments to forest cover types as specified below on at least 80 % of the forest cover type. Up to 20 percent of the type may be treated using other harvest methods specified in Forest Direction. (6074) b. Silvicultural Standards: (These standards may be exceeded on areas managed for old growth) Clearcut: - - - - - - - - - - - - - - - Interior Ponderosa

MANAGEMENT ACTIVITIES | GENERAL DIRECTION | STANDARDS & GUIDELINES

CONTINUATION OF:
Silvicultural
Examination
and
Prescription

	pine, Engelmann spruce-subalpine fir & Mixed Conifer	Aspen	Other Forest Cover Types
Rotation Age	90-180 yrs.	80-120 yrs.	100 or more yrs.
Growing Stock Level	80-160	N/A	60-120
Thinning Cycle	20-30 yrs.	N/A	20-40 yrs.

The largest increase in water available for stream flow results when 30 to 40 percent of a drainage is harvested in clearcut patches (3 to 10 acres) dispersed throughout the area of a watershed (Leaf and Alexander FS Res. Pap. RM 133).
(6155)

2. Apply intermediate treatments to maintain growing stock level standards.
(0140)

3. Utilize firewood material using both commercial and noncommercial methods.
(0147)

MANAGEMENT ACTIVITIES | GENERAL DIRECTION | STANDARDS & GUIDELINES

CONTINUATION OF:
Silvicultural
Examination
and
Prescription

4. For management purposes, a cut-over area is considered an opening until such time as:

- Increased water yield drops below 50 percent of the potential increase;
- Forage and/or browse production drops below 40 percent of potential production;
- Deer and elk hiding cover reaches 60 percent of potential;
- Minimum stocking standards by forest cover type and site productivity are met; and
- The area appears as a young forest rather than a restocked opening, and takes on the appearance of the adjoining characteristic landscape.

(0500)

a. When the Visual Quality Objective of an area is modification or maximum modification, the regenerated stand shall meet or exceed all of the following characteristics before a cut-over area is no longer considered an opening:

Forest Cover Type	Minimum Stocking Level (Trees/acre)	Tree Stand Height (ft.) 1/
Inland Ponderosa Pine	190	6
Mixed Conifers	190	6
Lodgepole Pine	150	6
Engelmann Spruce-Subalpine fir	150	6
Aspen	300	6

Forest Cover Type	Crown Closure (Percent)	Distribution 2/
Inland Ponderosa Pine	30	70%
Mixed Conifers	30	75%
Lodgepole		

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Silvicultural Examination and Prescription		Pine 30 75% Engelmann Spruce-Subalpine fir 30 75% Aspen 30 75% 1/ Applies to trees specified as minimum stocking level. 2/ Percent of plots or transects that are stocked. (6014)
Reforestation (E04)	1. Plant trees of known genetic qualities to establish new stands. (0275)	
Water Resource Improvement and Maintenance (F05 and 06)	1. Prolong streamflow, increase water yields and meet State water quality standards. (0145)	

MANAGEMENT AREA 9C

(Emphasis is on Increased Water Yield in Nonforested Areas)

SUMMARY

Management emphasis is on increased onsite water yield in nonforested areas through the use of structural facilities designed to manipulate available winter precipitation, i.e., snow.

Snow deposition structures are placed so that deposition occurs in selected areas to minimize evaporation and sublimation. Evaporation/sublimation suppressants may be used to increase longevity of developed snow packs. Management activities in foreground, middleground and background may dominate, yet harmonize and blend with the natural setting. Livestock grazing occurs, but not to the point that vegetation of nonforested areas or water yield objectives are impaired. Semiprimitive recreation is the predominate recreation use. Motorized travel may be prohibited.

B. MANAGEMENT REQUIREMENTS

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
Visual Resource Management (A04)	1. Management activities in foreground and middleground dominate, but harmonize and blend with the natural setting. Management activities may also dominate but appear natural when seen as background. (0263)	a. Do not exceed an Adopted Visual Quality Objective (VQO) of modification. (6267)
Dispersed Recreation Management (A14 and 15)	1. Semi-primitive nonmotorized, semi-primitive motorized, roaded natural and rural recreation opportunities can be provided. (0445)	
	2. Provide roaded natural recreation opportunities within 1/2 mile of Forest arterial, collector and local roads with better than primitive surfaces which are open to public travel. Provide semi-primitive motorized recreation opportunities with a low to moderate incidence of contact with other groups and individuals within 1/2 mile of designated local roads with primitive surfaces and trails open to motorized recreation use. Where local roads are closed to public motorized recreation travel, provide for dispersed non-motorized recreation opportunities. Manage recreation use to provide for the incidence of contact with other groups and individuals appropriate for the established ROS class. Provide semi-primitive non-motorized recreation opportunities in all areas more than 1/2 mile away from roads and trails open to motorized recreation use. (0650)	a. Maximum Use and Capacity Levels are: Recreation use and capacity range during the snow-free period (PAOT/acre): Trail use and capacity range (PAOT/mile of trail):

	Capacity Range			
Use Level	Very Low	Low	Moder-ate	High
ROS Class - Semi-Primitive Nonmotorized				
On Trails PAOT/mile	2.0	3.0	9.0	11.0
Area-wide PAOT/acre	.004	.008	.05	.08
ROS Class - Semi-Primitive Motorized				
On Trails PAOT/mile	2.0	3.0	9.0	11.0
Area-wide				

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Dispersed Recreation Management (A14 and 15)		PAOT/acre .004 .008 .05 .08
		ROS Class - Roaded Natural
		On Trails PAOT/mile - - - -
		Area-wide PAOT/acre .04 .08 1.2 2.5
		ROS Class - Rural
		On Trails PAOT/mile - - - -
		Area-wide PAOT/acre .5 .8 5.0 7.5
		Reduce the above use level co-efficients as necessary to reflect usable acres, patterns of use, and general attractiveness of the specific management area type as described in the ROS Users Guide, Chapter 25.
		Reduce the above use levels where unacceptable changes to the bio-physical resources will occur. (6402)
		b. Specify off-road vehicle restrictions based on ORV use management (FSM 2355, R2 Supp. 88). (6083)
		c. See FSM 2331, FSM 7732, FSH 7709.12 (Trails Handbook), FSH 7109.11a and 11b (Sign Handbook). (6226)

MANAGEMENT ACTIVITIES	GENERAL DIRECTION	STANDARDS & GUIDELINES
CONTINUATION OF: Dispersed Recreation Management (A14 and 15)	3. Permit undesignated sites in Frissell condition class 1 through 3 where unrestricted camping is permitted. (0174)	
	4. Manage site use and occupancy to maintain sites within Frissell condition class 3 except for designated sites which may be class 4. Close and restore class 5 sites. (0175)	
	5. Prohibit motorized vehicle use (including snowmobiles) off Forest System roads and trails in alpine shrub and Krummholz ecosystems. Prohibit motorized vehicle use off Forsst System roads and trails (except snowmobiles operating on snow) in other alpine, and other ecosystems, where needed to protect soils, vegetation, or special wildlife habitat. (0154)	
Range Resource Management (D02)	1. Confine livestock trailing to established driveways and historic trailing routes. (0270)	
Water Resource Improvement and Maintenance (F05 and 06)	1. Manage non-forested areas to improve streamflow through increased on-site water yields and meet State water quality standards. Usa available snowdrift technology, such as snow fences, windrowed brush piles, linear conversion of unbroken brush to grass, low earthen ridges, etc., to capture and stabilize blowing snow. (0303)	a. Structures are designed in terms of the size of and snow volumes available from the upwind source areas, local and downwind terrain features, prevailing winds, and deposition area conditions, etc., as referenced in 'Studying Snowdrifting Problems with Small-Scale Models Outdoors' by Tabler, R. D. and Jaivell, R. S., Proceedings Western Snow Conference, April 15-17, 1980. (6164)

APPENDIX H

Criteria for Large Group Camp Capacity

APPENDIX H

CRITERIA FOR LARGE GROUP CAMP CAPACITY

Introduction

Criteria were used to determine the Forest's capacity for backcountry camps used by large, horse-supported groups. These camp sites would be allocated for public use, administrative use, and outfitters and guides. The criteria are described as physical and biological. Physical criteria involve the physical attributes of an area that define its capability to support the forage requirements of transportation livestock and the needs of camp occupants for firewood and water. Also considered are characteristics that make some locations undesireable from an administrative standpoint. Biological criteria involve the capability of an area to absorb the impacts of large group camps, including sewage disposal for humans, fecal deposition by transportation livestock, and riparian vegetation disturbance from trailing, foraging livestock and campsite soil compaction. The operative factor in gaging acceptable levels of these impacts is the quality of water and the aquatic ecosystem. Adverse, unacceptable changes in these would result from unacceptable levels of impacts described above.

The following lists physical and biological criteria used to determine suitable sites for use by large, horse-supported groups.

Physical Criteria

- Sites suitable for commercial operations shall be at least one-half acre in size on slopes not exceeding five percent.
- No more than one designated camp shall be dependent on the same grazing meadow or grazing area.
- Each camp shall have at least 15 AUM's available for transportation livestock. AUM capacity shall be based on approved score card for fair or better range. Selected grazing area can be grazed without damage to the resource. Range shall be within one mile of the camp. End-of-road camps are excepted from this grazing requirement.
- All camps shall be located below timberline.
- All camps shall be located at least 100 feet from live streams (springs excluded), lakes and wet meadows.
- All camps shall be located within 200 yards of water.
- Dead firewood shall be available within one-half mile of each camp.
- All camps shall be located at least one-half mile from all cabins and administrative sites.

- Camps shall be located at least 100 feet from trails and outside the foreground "seen" area from roads.

Biological Criteria

- Unsuitable areas are those located by perennial streams along valley bottoms less than 200 feet wide and lacking flat benches that are more than 100 feet from surface water.

- Suitable sites are those in which ample areas of soil at least four feet deep and 100 feet from surface water are readily available for construction of camp privies, or other sewage disposal.

- Where suitable sites (according to all the above criteria) exist in the same drainage, at least one linear mile must be allowed between them to assure adequate dispersion. This distance is intended to mitigate trailing damage and allow at least one stream mile for the dilution of any chemical or biologic pollutants that reach surface water.

Factors Considered in Biological Criteria Development

A large group camp (LGC) consists of campers, saddle horses, pack animals, and facilities necessary for an extended stay. Due to the physical criteria that are used to designate suitable LGC's, these camps are generally in or near riparian areas associated with perennial streams or lakes. Campers engage in bankside activities such as fishing, hiking, or horseback riding. Trails along banktops are quickly developed. Campers eliminate wastes near campsites, clean fish in or near streams, generate cooking wastes and wastewater in considerable quantities. Human sewage is produced at an average rate of three pounds per day per adult (FSH·7409.11, 51.1).

Horses or other pack animals graze in or near riparian areas if given an opportunity. Wastes are eliminated there. This compounds the waste produced by wildlife (or cattle) and deposited in the same areas. Horses generate an estimated 30 to 45 pounds of waste per day.

Riparian areas by definition have high water tables, where soils are saturated all or part of a year. These areas are also subject to periodic flooding. Weakened banks are more subject to flood damage, bare areas such as trails produce sediment and waste materials directly enter surface flows during flood events.

Camping wastes consist primarily of food, grease, soap and detergents. Human sewage contributes a variety of bacteria (as does animal waste) and nutrients that cause eutrophication. Human wastes deposited in backcountry areas (and buried in shallow pits) have been linked to the incidence of Giardiasis. Increased amounts and concentrations of human sewage will increase the probability of Giardia (spp.) contamination in streams.

Considering the maximum party size anticipated, 10 people and 15 horses or pack animals, the accumulation of waste, waste water, and refuse (such as fish entrails) could be considerable. Human sewage would accumulate at the average rate of 30 pounds per day, animal waste at 450 to 675 pounds per day (some of which is probably directly leached into the streamside water table).

The occupation of a site at frequent intervals or for extended periods of time would lead to the accumulation of large amounts of waste near the camp. One week's accumulation would be 210 pounds of human sewage and 3,150 to 4,725 pounds of animal waste (a percentage of which would be dispersed during daily trips away from camp).

Streams do not "purify" themselves. Pollutants that are added to streams eventually become thoroughly mixed through the stream crossection, down the stream and by dilution from tributary flows. Some evidences of pollution are broken up by wave action or flow over rocks. Other pollutants are taken up by vegetation, adsorbed onto suspended sediment or materials in the stream substrate. Some biological pollutants lose their efficacy as they travel downstream in highly oxygenated water, as in most streams on the Forest. Some pollutants merely settle out into low velocity reaches of stream or along streambanks. A stream requires a certain distance, measured from a pollution source, in which to mix, dilute, "treat", or otherwise effectively neutralize a pollutant. This distance varies according to the physical characteristics of the stream, the chemical characteristics of the water, and the nature of the pollutant itself.

Dispersion of activities and people can, to a degree, lessen physical impacts such as trail and streambank damage. Adequate separation of LGC's within a drainage will have this effect.

Other Recommendations

If increased densities of LGC's occur, or if large numbers of other users occur along with LGC's, other measures may be considered: hardening of campsites and trails; stabilizing streambanks; providing self-contained sewage disposal facilities; requiring permitted LGC's to carry sewage out; increase administration and control; implement area closures; or require permits of all wilderness visitors.

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